FAWCETT'S

MODERN MECHANICS AND INVENTIONS

JUNE 25¢

PRIZES FOR HOME BUILT BABY AUTOS

THRILL MAKERS OF CONEY ISLAND

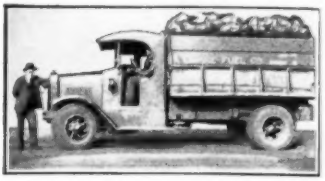
SHATTERING EVERY RECORD

PYROIL under official test at St. Louis, Mo., airport actually saves 5 gallons of gasoline per hour on a standard transport plane in addition to other sensational accomplishments!
PYROIL now under official test in 2 branches of U. S. Government Aeronautical Service.

PYROIL Heat-proof Liquified Graphite

Amazes the Entire Motor World

A highly concentrated lubricant embodying patent-protected liquefied graphite. ABSOLUTELY GUARANTEED to contain no ingredients which could possibly injure the finest mechanism.



Loaded Truck Runs 30 Miles Without Oil!

PYROIL equipped motor truck owned by Empire Fuel Company, St. Louis., Mo., which was run fully loaded A DISTANCE OF 30 MILES, **without oil** and with no harm to motor!

POSITIVELY

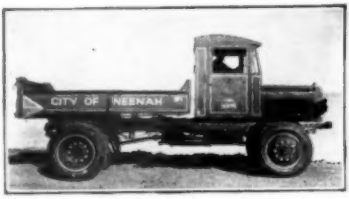
Stops wear—stops noise—cuts repair bills. Doubles, triples life of ordinary crankcase oil. Reduces gas consumption up to 20% to 40%. Withstands heat up to 7500° F. Cannot burn—cannot wash off bearings. Passes any filter—even chamois skin. Gives instant starting, at 40° below zero. Enjoys patented protection. Is guaranteed 100% satisfactory.

Proof

Such As Has Never Been Enjoyed By Any Other Product

The Pyroil Co. Positively Guarantees all Claims and Statements.

PYROIL endorsed by Pacific Coast Distributor of Outboard Motors Corp. as **best lubricant** for all internal combustion motors!
PYROIL adopted by Chicago Nash Company.
Endorsement from Mack International Motor Truck Co., Denver Branch.
100% O. K. test at Willys-Overland factory.
Leading fleet owners of Chicago, St. Louis, Milwaukee, and others adopting PYROIL.
Hundreds of other sensational accomplishments.
Inquiries by the thousands from national publicity. Orders referred to district agents and distributors, making sales easy and practically automatic.



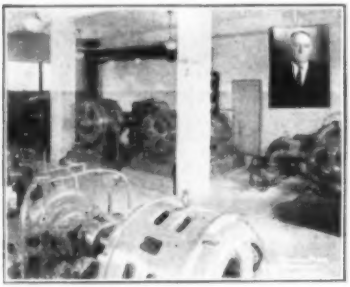
Motor truck owned by Oshkosh Motor Truck Co., Inc., recently exhibited at Wisconsin State Road School, Madison, Wis., equipped with PYROIL throughout. Rigid tests resulted in PYROIL **adding 3 miles per gallon of gas used.**

Iron Clad Money-Back Guarantee

Because PYROIL results are so remarkable as to be almost unbelievable by those unfamiliar with its merits, in any case where it is used as directed and the user is not completely satisfied, the PYROIL COMPANY WILL REFUND THE PURCHASE PRICE IN FULL upon return of the unused portion of the oil.

Pyroil Helps Shatter World's Endurance Mark

At Tallahassee, Fla., O. F. Ellison and L. F. Walker smashed the world's motor endurance record by driving the Outboard Motor Boat pictured here, for 662 hours, 27½ days, without stopping. PYROIL LIQUEFIED GRAPHITE—used throughout this official test—made this amazing feat possible!



Pyroil Stops Chronic Hot Box

"We had one pump motor bearing that ran exceedingly hot. After using PYROIL for ten days, it was one-fourth cooler!"
(Signed) R. W. Killian, Foreman (Inset above)
City Pumping Plant, Wenatchee, Wash.

W. V. KIDDER, President
THE PYROIL COMPANY
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Men! These startling facts—only a few of hundreds of similar cases—speak for themselves. PYROIL offers **you** a profit opportunity so vast that neither words nor figures can here adequately describe it.

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Mail the attached coupon without delay for further Pyroil records and facts and the most sensational profit opportunity ever offered anywhere at any time. *Don't delay.*

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W. V. KIDDER, President
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"It was a great day for us when you called my attention to that International Correspondence Schools advertisement. That little coupon I signed started us on the way to independence and success. There'll be lots more vacations too."

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Vol. VI — No. 2

MODERN MECHANICS AND INVENTIONS

PRICE 25 CENTS

This magazine is not connected with or associated with any other magazine of a scientific or mechanical nature.

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...Raised His Pay $4800* After Reading This Amazing Book Which Is Now *FREE!*

*Based on the combined experiences of F. B. Englehardt, Chattanooga, Tenn., A. F. Thompson, Sioux City, Iowa; L. Van Houten, Grand Rapids, Mich., and many others.

Caught in a Rut

I wonder I put up with it as long as I did! Every day was filled with nothing but deadly routine and monotonous detail. No freedom or independence. No chance to get out and meet people, travel, nor have interesting experiences. I was just like a cog in a big machine with poor prospects of ever being anything more.

Long, Tiresome Hours

Every hour of the day I was under somebody's supervision. The TIME-CLOCK constantly laid in wait for me—a monument to unfulfilled hopes and dying ambition. Four times a day, promptly on the dot, it hurled its silent challenge at my self-respect, reminding me how unimportant I was and how little I really COUNTED in the business and social world!

Low Pay

Paid just enough to keep going—but never enough to enjoy any of the GOOD things of life every man DESERVES for his family and himself. Always economizing and pinching pennies. Always wondering what I would do if I were laid off or lost my job. Always uncertain and apprehensive of the future.

Desperate

Happened to get a look at the payroll one day and was astonished to see what big salaries went to the sales force. Found that salesman Brown made $300 a week—and Jenkins $275! Would have given my right arm to make money that fast, but never dreamed I had any "gift" for salesmanship.

A Ray of Light

Stumbled across an article on salesmanship in a magazine that evening. Was surprised to discover that salesmen were made and not "born" as I had foolishly believed. Read about a former cowpuncher, Wm. Shore of California, making $525 in one week after learning the ins-and-outs of scientific salesmanship. Decided that if HE could do it, so could I!

The Turning Point

My first step was to write for a certain little book which a famous business genius has called "The MOST AMAZING BOOK EVER PRINTED". It wasn't a very *big* book, but it certainly opened my eyes to things I had never *dreamed* of—and proved the turning point of my entire career!

What I Discovered

Between the pages of this remarkable volume, I discovered hundreds of little known facts and secrets that revealed the REAL TRUTH about the science of selling! It wasn't a bit as I had imagined. I found out that it was governed by simple rules and laws that almost ANY man can master as easily as he learned the alphabet. I even learned how to go about getting into this "highest paid of all professions". I found out exactly how Mark Barichievich of San Francisco was enabled to quit his $8 a week job as a restaurant-worker and start making $125 a week as a salesman; and how C. W. Birmingham of Dayton, Ohio, jumped from $15 a week to $7500 a year—these and *hundreds* of others! It certainly was a revelation!

FREE Employment Service

Furthermore, I discovered that the National Salesmen's Training Association, which published the book, also operates a most effective employment service! Last year they received requests from all over the U. S. and Canada for more than 50,000 salesmen trained by their method. This service is FREE to both members and employers and thousands have secured positions this way!

Making Good At Last!

It didn't take me long to decide to cast my lot with N. S. T. A.—and after a few weeks I had mastered the secrets of Modern Salesmanship during spare time, without losing a day or a dollar from my old job. When I was ready, the Employment Manager found me over a dozen good openings to choose from—and I selected one which paid me over $70 a week to start!

Was It Worth It?

Today my salary is $4800 greater than ever before! No more punching time-clocks or worrying over dimes and quarters! NOW my services are in REAL DEMAND with bigger prospects for the future than I ever dared HOPE for back in those days when I was just another "name" on a pay-roll!

Get Your Copy FREE

Right now the book—"The Key to Master Salesmanship" which banished all my fears and troubles and showed me how to get started on the road to success and independence—will be mailed as a gift to any ambitious man, absolutely FREE. And since there is no obligation, why not see for yourself what amazing facts it contains! Just mail the coupon now—for there is no better way in the world to invest a 2-cent stamp—I KNOW! NATIONAL SALESMEN'S TRAINING ASSN., Dept. G-703, N. S. T. A. Bldg., Chicago, Ill.

National Salesmen's Training Assn., Dept. G-703, N. S. T. A. Bldg., Chicago, Ill.
Without obligation, please send me a free copy of "The Key to Master Salesmanship," and other details of N. S. T. A. service.

Name ..... Address .....

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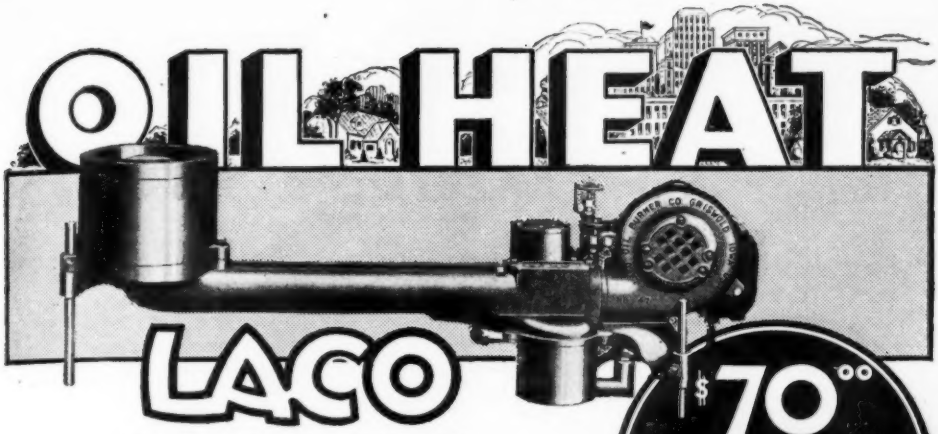

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M. N. Bareham
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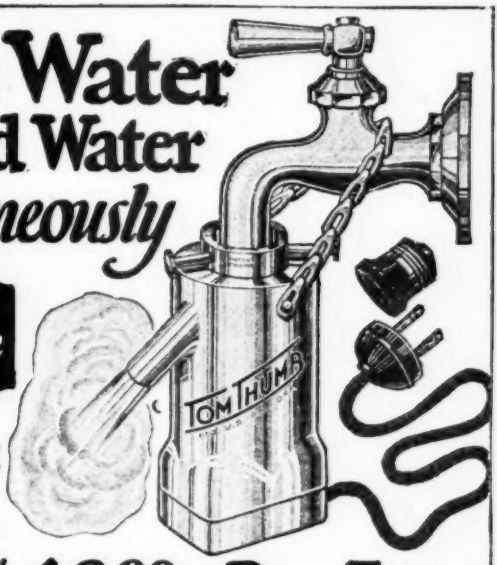

Only $3.75 Complete

Agents! This Marvelous Invention Will Make Up to $40.00 a Day Easy

KITCHEN

SHAVING

BATH

DOCTOR

FACTORY

Just plug in at the nearest electric outlet and presto!—you have instantaneous, continuous running hot water from your cold water faucet. This tells you in a nutshell why the invention of the Tom Thumb automatic electric hot water heater will make it easy for you to make up to $40.00 a day.

The electric heated steaming hot water comes direct from the faucet instantaneously—yes, as quickly as you can turn on the current and the hot water runs indefinitely until you shut off the electricity. The cost is small—convenience is great. Useful wherever hot water is needed—no fuss or bother—attached to any faucet in a jiffy. Works on either AC or DC current. You and your customers will marvel and be delighted at this new discovery of electrical science. The small cost of $3.75 for the Tom Thumb, Junior (110 volts) or $5.75 for Tom Thumb, Senior (220 volts) does the work of any expensive hot water heating equipment costing several hundred dollars—the Tom Thumb absolutely eliminates the plumber or any other additional expense.

No Installation - Stick One On Faucet and Sale Is Made

Think of it! no installation, no extra expense—nothing else to do but to stick it on the faucet, turn on electricity and it is there ready for duty. Easily removed when not wanted and easily carried to any part of house where cold water is running and hot water is wanted. Has many uses—too numerable to mention here. Weighs only 1 lb., made entirely of aluminum. Cannot rust, no moving parts, nothing to get out of order.

If $40 A Day Sounds Good To You Rush Coupon

This new scientific invention offers tremendous sales possibilities. At the low price of $3.75 you should be able to sell at least forty a day. You pocket $1.00 cash commission on every sale. If you would like to know all about this proposition, sign your name and address to coupon or, better still, get started selling at once. Attach money order for $2.75 to coupon and rush to us. We will send complete selling outfit containing 1 Tom Thumb electric hot water heater, order blanks, selling particulars and everything necessary to help you get started making up to $40.00 a day at once.

Terminal Products Co., Inc.,
Dept. 1106, 200 Hudson St.,
New York, N. Y.

The Tom Thumb electric hot water heater looks like a big money maker to me. I am sure interested in knowing how to make up to $40.00 a day with this proposition. I have checked below the proposition I am interested in at this moment.

☐ Enclosed find money order for $2.75. Please send me one Tom Thumb Junior, order blanks and selling information. It is understood upon receipt of this sample outfit I will be permitted to take orders and collect $1.00 cash deposit for every Tom Thumb, Jr. I sell, or $1.50 for every Tom Thumb, Sr. I sell. It is understood I will send the orders to you and you will ship direct to my customers C.O.D. for the balance.

☐ I would like to have additional information before acting as one of your agents. Please send this by return mail free of obligation.

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If you live outside of the United States, price is $1.00 extra on each unit, cash with order.

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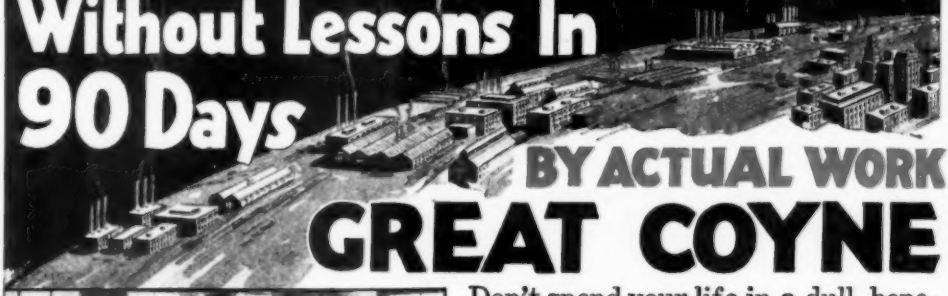
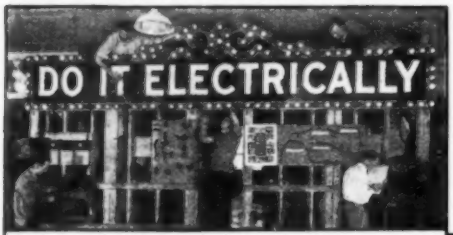


BY ACTUAL WORK

GREAT COYNE

Students working in our Alternating Current Dept.

Instructor explaining operation of modern airplane motor



Students getting actual experience on modern electric sign

Don't spend your life in a dull, hopeless job! Don't be satisfied with a mere $30.00 or $40.00 a week! **You don't have to.** Electricity pays salaries of $60, $70 and even $200 a week to thousands of fellows no smarter than you. **And you can learn Electricity at Coyne in 90 days—NOT BY CORRESPONDENCE, but by actual electrical work.**

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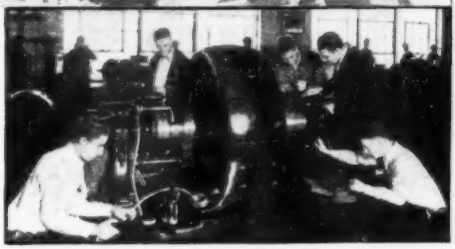
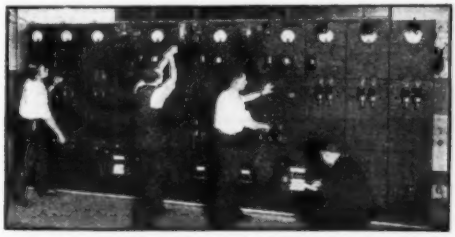


Students working on a large synchronous Converter



Students learning switchboard work by actual practice

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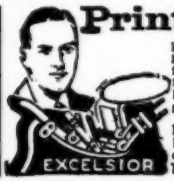

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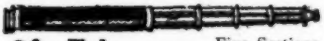

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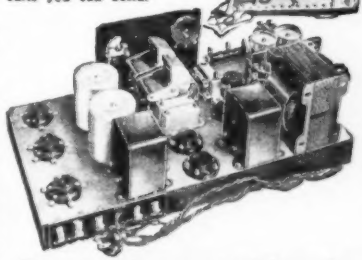

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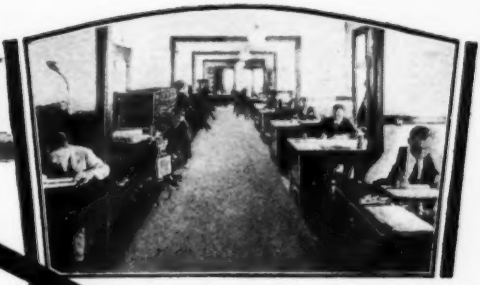

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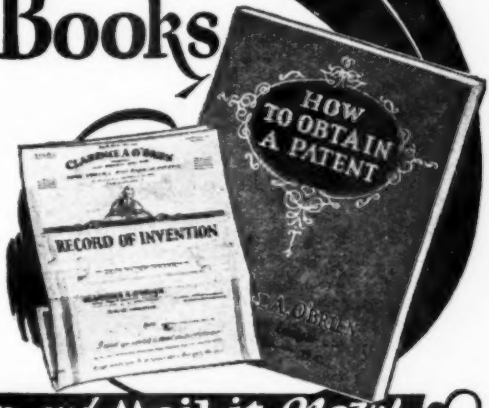

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Please send me your free book, "How to Obtain a Patent," and your "Record of Invention" form without any cost or obligation on my part.

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Call out the Reserves! That's just what the pilot of the Heath Super-Parasol is doing in this picture, which seems to prove that the pilot of one of these here Parasols has some Reserves to call on. The Heath, we all know, is a one-man affair, which I can prove by pointing out that there is only one seat. But is a great consolation to any peelot to know that he has extra power under his streamlined cowl to carry a passenger, even if he doesn't make a habit of parking his step-father on the wing-strut.

Andy's Shop Mail Box

"Confidential Advisor to Amateur Aeronuts" is the title recently bestowed upon the ever youthful brow of the world's most famous grease monkey. This monthly column is the official organ of the M. M. Hangar gang.

WELL GANG, Spring is in our midst again! The air is full of little birds, light planes and atmosphere; the sap is rising in the trees, and I got up pretty early myself this morning, seeing as how it's about the time of the month when I have to bat out this here colyum.

The light plane contest has come to an end, and you'd be surprised at all the good light planes that have been built from Double M plans, from original plans, or from no plans at all. Next month the Eds are going to announce the results, but if you can't wait until next month to know how things came out you can always write to me. I'll merely file the letters away in the rear cockpit of Gene Shank's Jenny and wait until the next issue is out. Then I'll refer you to your nearest news stand.

Stan and Walter Baldiga of Dayton, Ohio, are shown in the car they built for less than $300.

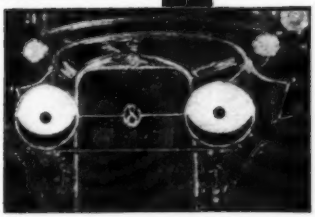
In the meantime, just cast your headlights over the front cover and then turn to page 104 of this month's mag. Here's a brand new contest, but this time the contraption is supposed to remain on the ground. Just to save you the price of a couple of 2c stamps, I might mention here that you're supposed to design your own entry for this contest, and that neither myself nor Ray Kuns will answer questions regarding the building of midget cars until after the contest is closed.

(Continued on page 24)

NEW KIND OF AUTO EYES

Makes Night Driving Safer Than Day!

No more driving "blind" on a crowded highway at night! An astonishing new invention banishes night wrecks and smashups. Ends fear of running over children or animals. Mail coupon quick for the manufacturer's introductory Free Test Offer.



These new kind of Lights even LOOK entirely different. No wonder every installation brings a dozen more sales.

Lights up entire roadway, including ditches at side. Gives perfect illumination without shadows or flickering.

Banishes Glare Shields, Spot Lights, etc. Floods the road with light, yet absolutely cannot glare.

FITS ANY HEADLIGHT — ENDS DANGEROUS DIMMING — DOUBLES ROAD LIGHT!

AT LAST! An amazingly queer yet simple invention lifts the bane and curse of night driving from the motoring world. Actually like magic this altogether new discovery replaces the "bulbs" in automobile headlights with truly amazing results. Road illumination is instantly doubled, yet glare is absolutely banished. Ordinary objects in the road, ruts, animals, obstructions, etc., are made clearly visible at least **three** times as far. Even cuts right through fog, mist, rain and snow. Gives you a solid wall of light 3 feet high, 25 to 30 feet wide. Instead of ordinary "direct" light, this beam is composed entirely of double-reflected or "infused" light. This new kind of beam pours down the highway ahead of you so far that you can actually see to go 70 miles an hour in safety. At a 40 to 50 mile an hour clip, it is positively safer than daylight because all the light is on the road and you see nothing of your surroundings to distract you.

INEXPENSIVE

Patent rights in this new lighting invention are fully protected. It is not in any sense a new "attachment." There is no wiring or installation. No extra up-keep. In the past, millions of motorists have paid from $10 to $25 for so-called spot-lights and driving-lights that at best are only make-shifts. This new method costs only a fraction as much and actually **doubles** road illumination with your present headlights! Cuts through the other fellow's light so you can see the road, yet absolutely cannot glare in his eyes. No wonder fleet owners, manufacturers, taxi and bus lines, etc., concerns like H. J. Heinz Company (57 varieties), Pittsburgh; Houston Post-Dispatch, Tex.; Wallace & Tiernan, N. J.; Columbus, Ohio, Fire Trucks, etc., are fast turning to this discovery as standard equipment. It's positively needed on every car in America, new or old **right this minute.**

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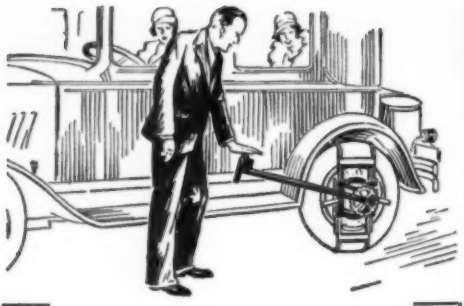

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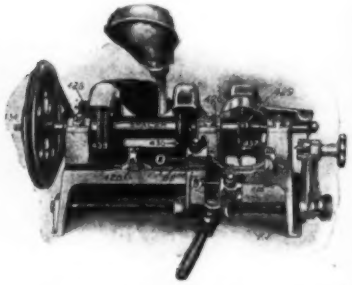

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ANDY'S SHOP MAIL BOX

(Continued from page 20)

AND while we're on the subject of light cars, take a slant at that little bus shown on the first page. It was built by Stanley and Walter Baldiga, who live at 417 Wesley St., Dayton, Ohio.

The car is a two-passenger affair with a rumble seat for baby. It does 70 miles an hour and runs 40 miles on a gallon. The running gear is composed of four 20x4 airplane wheels.

Arthur Branston, Jr., and his tandem scooter.

But to get strictly up-to-date dope on the latest inventions we must turn to the younger generation. Here's the letter which goes with the above pic:

2228 W. 14th St.,
Los Angeles, Calif.

Dear Andy:

I am sending you a photograph of the latest development in modern transportation. It is a new use for an old principle and is considered the last word by the young "inventors" and their friends. They may be found at the following address: Arthur Branston, Jr., 2228 W. 14th St., Los Angeles, Calif.

Yours till we push up daisies,

JOHN CLIPSTON.

AS I said in my opener, Spring is here, and it seems to affect different people in the same way. Joe Lewis, who lives at Union, Nebraska, went into a tail spin on his test hop and came out with the following ditty tangled up in his empennage:

ODE TO A GREASE MONKEY

You know up here at Robbinsdale
There lives a guy that raves and rails
'Bout this 'n that 'n other thing,
In the old M. M. Magazine.

(Continued on page 28)

THEY HOOTED when I offered to play—

but after the first piece..

LOIS was almost in tears. It was her first big party. And —of course, the radio had to pick just that night to go on a vacation!

Poor Lois! The whole roomfull of people sitting around, bored, hardly knowing what to do with themselves.

"Oh, Jack," she told me, "I'm nearly sick. Everybody is having a terrible time. We can't dance or anything."

"Well," I offered, gathering my courage, "I'll play for them to dance."

"You!" she exclaimed. "Why, you can't play, Jack. It's awfully sweet of you, but . . ."

"Watch me," I said. I faced the room and called out: "Folks, I'm going to play."

There was a chorus of good-humored hooting.

"Did anybody else hear what I did?" Ed laughed.

"Jack's a magician," Bill announced. "It's all done with mirrors."

I played up to the farcical mood, swept my hand over my hair and made a few grotesque flourishes. There was a gale of laughter.

Suddenly I swung into the joyous notes of "Happy Days." This was real playing, and suddenly the laughter ceased. At last I felt the thrill of being able to entertain, of *contributing* to the party.

When I stopped there was a moment of silence, and then I was deluged with questions. *When had I learned to play? Where had I studied? Who was my teacher? Where had I been hiding my talent all these years?*

How I Learned to Play

I told them the whole story, how I had always longed to be able to play the piano but had never had the patience to sit down for hours and practice. Besides I could not have afforded to pay a private teacher.

But one day, while looking through a magazine, I saw an advertisement of the U. S. School of Music. The ad offered to send a Free Demonstration Lesson to prove how easy it is to learn to play at home, without a teacher, in one's spare time.

"When that demonstration lesson came I saw at once how really easy and interesting the course was, and so I sent for it. Learning to play was actually fun —no finger twisting exercise — no long hours practicing scales. It was as easy as A-B-C. But I didn't tell you folks because I wanted to be sure of myself first."

They could hardly believe me. But in a few minutes they begged me to play more, and everyone danced. Lois was happy and grateful. She said later that I had saved the party. And now that people know I can *really play* I have invitations out practically every night.

This is a typical story. More than 600,000 people who couldn't read one note from another have become good players by using the clear, simple method originated by the U. S. School of Music. The course is so graphic, so easy that a child can understand it. First it tells you what to do—then it *shows* you how in pictures—then you do it yourself and *hear* it.

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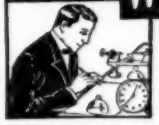

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Railway Postal Clerks now get $1900 the first year, being paid on the first and fifteenth of each month. $79.16 each pay day. Their pay is increased $100 and $150 a year. The maximum is $2700 a year, $112.50 each pay day. They get extra allowance for hotel expenses when away from home.

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Clerks and Carriers get $1700 the first year regular and automatically increase $100 a year to $2100 with further increase to $2300. They also have 15 days vacation. City residence is unnecessary.

What Will You Earn 5 Years from Now?

DO YOU EARN $1900 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET $2700 OR MORE A YEAR, EVERY YEAR?

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☐ Rural Mail Carrier	($2100-$3000)
☐ General Clerk—File Clerk	($1260-$2500)
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Address.....

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Gentlemen: Please send me your FREE book which tells about your laboratory method of radio instruction at home.

Name_____

Address_____

_____

Occupation_____

ANDY'S SHOP MAIL BOX

(Continued from page 24)

'Spect some of you folks already knows
This guy's profile from his head to his toes,
But for you birds that are too dumb,
I'll give you a description.

His age I guess is about twenty-nine,
You see he's too old to ever shine
In history of this land of the free,
He ain't no better 'n jes' you and me.

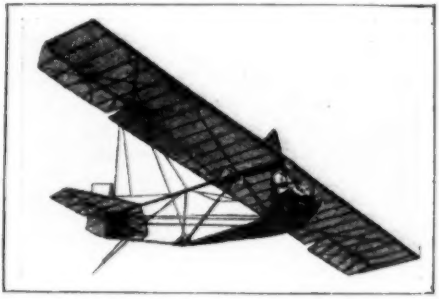
He's mostly white from what I hear,
And over the wimen he's shed nary a tear.
And which explains, I rather guessed,
For the fact that his pants are never prest.

His job isn't a high cafflutin' one,
(Don't take me serious, it's all in fun)
He cleans the motors and shines the props,
To make the airplanes go hippity-hop.

Now, if you folks can't understand,
Who this guy is I'm tryin' to slam,
I'll tell you his name, an' make my bow,
It's little Andy, an' he's a wow!

—JOE LEWIS.

I'm not a poet either, Joe.



This Northrup primary glider, built from M. M. plans by George McClusky, of Hudson, Ohio, won a spot landing contest at Cleveland, Ohio.

THE Disston & Sons, Inc., of Philadelphia, Pa., announce that they are issuing a booklet, free of charge, which tells users of saws, tools, files, etc., all about the care and selection of these important items. It also tells of every step necessary in working correctly with these tools.

I KNOW you fans are interested in monkeys, especially those of the grease variety, for my mail is the largest of any such animal in the great Northwest. But what I want to know is how you like these other animal yarns we run in the middle of the magazine.

(Continued on page 34)

Eagles of the Air

TRAIN WITH VON HOFFMANN *for* YOUR PLACE IN AVIATION

Proof that VON HOFFMANN Graduates are Readily Accepted

On file in our office are many letters from graduates telling of their more ready acceptance for positions because they were Von Hoffmann trained.

Below are excerpts from two of them:

Mr. T. H. Worthington writes that he got a job as soon as he graduated. In writing about the incident he says—"Just as soon as I stated I graduated from Von Hoffmann Air College, I noticed they took more interest in me."

Mr. Richard McDougall, another graduate who is now an instructor in another school writes—"When I told them I graduated from Von Hoffmann they gave me the job."

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If you are over 16 years of age send in the coupon below and we shall send you full particulars.

U. S. Dept. of Commerce approved School for Transport, Limited Commercial, and Private—Ground and Flying.

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242 Lambert-St. Louis Municipal Airport, St. Louis, Mo.

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Address .....

City ..... *State* .....

Age ..... *I am interested in*

( ) Flying Course ( ) Mechanics Course
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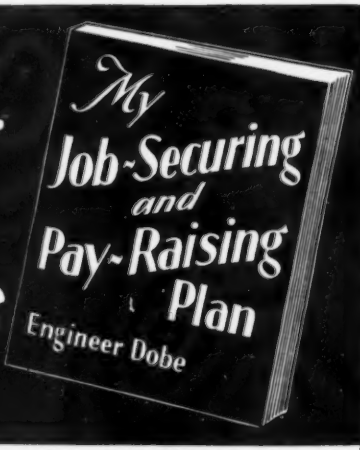
I'll send you my Job-Securing Pay-Raising Plan . . . . .

free



Every Man in These Industries Should Write for "My Job-Securing, Pay-Raising Plan"

Check your job here—or write what you have done

- ☐ Metal workers
- ☐ Builders
- ☐ Pipe fitters
- ☐ Tool makers
- ☐ Telephone workers
- ☐ Pattern makers
- ☐ Steam fitters
- ☐ Engineers
- ☐ Railroad workers
- ☐ Chemists
- ☐ Textile workers
- ☐ Radio workers
- ☐ Factory workers of all kinds
- ☐ Mill workers
- ☐ Electricians
- ☐ Machinists
- ☐ Structural workers
- ☐ Bridge workers
- ☐ Auto mechanics
- ☐ Steam engineers
- ☐ Ventilation engineers
- ☐ Section foremen
- ☐ Air brake workers
- ☐ Coal miners
- ☐ Boiler makers
- ☐ Carpenters
- ☐ Lathers
- ☐ Contractors
- ☐ Electric and gas welding men
- ☐ Telegraph workers
- ☐ Building estimators
- ☐ Foremen of all kinds
- ☐ Plumbers heating
- ☐ Surveyors
- ☐ Section workers
- ☐ Highway engineers
- ☐ Navigation men
- ☐ Brick layers
- ☐ Plasterers
- ☐ Aviators

CHECK the WORK You Are DOING—Tear Out the coupon and Mail It for BOOK—FREE

If you have a job or have ever worked in any of these industries, and want a better job, ask for this book. Put your name on the coupon. It will cost you only a two-cent stamp.

I have been helping men to get better jobs for more than thirty years. I help you to a better job by training you for practical work in plan drawing, blueprint making and blueprint reading. By practical training which you take at home, I make you proficient as a draftsman. You become more valuable wherever you have a job or wherever you go. Your chance to get more money is vastly increased if you know blueprints and draftsmanship.

The blueprint and drawing are the language of mechanics. You cannot advance as far as you should without a knowledge of that language. One idea given to the boss in a blueprint made by yourself may promote you and raise your pay, and the boss will sit up and take notice when you show him you can make a working drawing or blueprint. If you are a railroad worker, you will be a better man and advance faster if you know drawing and draftsmanship. If you are a factory worker, you will be more certain of a raise and advancement. You will be a better carpenter and a better bricklayer.

If you don't know blueprints, you cannot speak the mechanical language and you cannot tell anyone just what your idea is.

After I train you to know blueprint making and reading and to be a practical draftsman, you are ready to step into a job leading to salaries of from $75.00 to $200.00 a week. Many men I have trained are earning this money. I can prove that John Savadge, trained by me, makes $300.00 a month. Earl J. Dupree, trained by me, refused $600.00 a month because he makes more in his own business. A. H. Bernier, trained by me, earns $7,000 to $9,000 a year. Arthur Dewalt, trained by me, makes more than $400.00 a month. D. C. Stroop, trained by me, makes $475.00 a month. L. V. Broughton, trained by me, makes $300.00 a month.

I can give you many more names of Dobe-trained draftsmen who are making big salaries. They wrote me just as I am asking you to write. They asked for my Free Book. They saw that opportunities in all of the great industries were tremendous for draftsmen. Through drafting you can get into almost any industry you want.

Here are the tools you get

I Train You at Home for a BETTER JOB!

You don't need to leave home to take this training. Neither do you need experience nor more than a simple education. Your age makes no difference, just so you are over sixteen. My method of training is so simple that almost anyone can grasp it. While you are learning in your home to be a draftsman, I make it possible for you to earn extra money by doing so. When you have finished, I help you to secure a position. If, after you have taken this training, you are not entirely satisfied, I return all of your money. Remember, all the training I give you is right at home. To teach you, I merely ask you to do the things you would have to do if you had a draftsman's job right now.

As soon as you decide to fit yourself for a better job by learning plan drawing, blueprint making and blueprint reading—draftsmanship, and tell me that you have decided to go ahead, I will send you this fine imported set of drawing instruments shown here. You get them as my student. They come as part of the course.

IF YOU EARN LESS THAN $70.00 A WEEK

Put your name on the coupon—check (√) where you work or have worked above—tear out the coupon and mail to me. I'll send the book, "My Job-Securing and Pay-Raising Plan" Free. It is positively not a catalog. It is a book written for men who have ambition and who want to advance to better positions, to higher pay and a better plane of living. I want you to have it. I ask you to send for it.

Engineer Dobe 1951 Lawrence Ave. Div. A-235, Chicago, Ill.

FREE JOB-SECURING PLAN

ENGINEER DOBE, Div. A-235
1951 Lawrence Ave., Chicago

Please send me free of all cost, "My Job-Securing and Pay-Raising Plan", also free Draftsman's Rule.

Name _____ *Age* _____

Address _____

Post Office _____ *State* _____

Buy DIRECT
on credit
at New
Low Prices
Our 1931 Cut-Price
Offers a Remarkable
Opportunity to Own
A 21 Jewel
Santa Fe
Special
Send
for
Catalog
Now!
Compare
the Santa Fe Special
with other Watches costing
50% to 50% More
Send No Cash In addition to our NEW LOW PRICE, I will send for your approval one of these Standard Watches, guaranteed for a lifetime of satisfactory service, not only by the Santa Fe Watch Company, but by the Great Illinois Watch Factory. So accurate, Government officials carry them; so perfect and beautiful, jewelers say they are worth ½ to ⅔ more than we ask for them. I will send you one to see WITHOUT ONE PENNY DOWN—allow you to wear it 30 days FREE—then sell it to you on easy payments.
Diamond Rings—Wrist Watches
Write for our New Diamond Ring of Romance and Bulova Wrist Watch Catalog, showing marvelous new designs. Never have we been able to offer such beautiful diamond rings and artistic dependable watches at such low prices. The catalog is sent FREE.
Ask for our Special Spot Cash Offer.
Good for 30 days only.
SANTA FE WATCH CO.
636 Thomas Bldg. TOPEKA, KANSAS
To SANTA FE WATCH CO.,
636 Thomas Bldg., Topeka, Kans.
Please send me catalog I have checked.
Railroad and dress Pocket Watches.....☐
Ladies' and Men's Wrist Watches.....☐
Ladies' and Men's Diamond Rings.....☐
Name .....
Address .....
.....

ANDY'S SHOP MAIL BOX

(Continued from page 28)

Did you read Frank Buck's story on how he captures wild animals alive? Pretty exciting stuff, says me, and to my alleged mind it has flying beaten sixty different ways for thrills. If you would like to read more of this, you can obtain the book, *Bring 'em Back Alive*, which was written by Frank Buck and Edward Anthony, from Simon and Schuster, Publishers, of New York.

"LET'S GET ACQUAINTED" DEPARTMENT

Maurice I. Flagg, genial conductor of our Home-Building Department, poses for his portrait in company with his severest critic (Mrs. Flagg).

HOW do you like getting acquainted with the members of the Double M staff? Yeah, I thought you'd like it. I meant to run my own mug this month, but the chief of staff says we musn't get too low-brow so I'm giving you a portrait which was originally intended for the Society Section.

That picture up there on top is of the fellow that writes that stuff on "Building a Home That Pays for Itself." I told him he could go ahead and build one for me, and when it had paid for itself he could sign the deed over to me, but so far I'm still chowing up at Mrs. Nelson's boarding house. This morning we had fried mush for breakfast. I wish Morrie would get out an article on "Conducting a Colyum That Writes Itself."

(Continued on page 36)

ANSWERING your 3 BIG QUESTIONS about the FAMOUS HEATH PARASOL

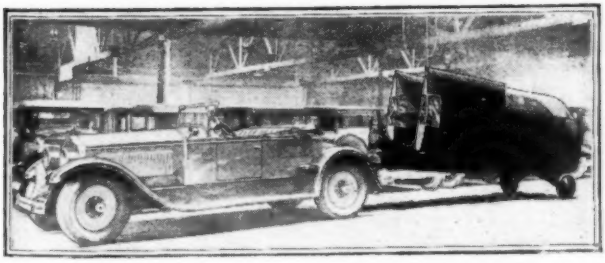
1. CAN I BUILD IT?

No technical training is required to build this great little plane. Heath plans and type-written instruction sheets simplify every operation. Hundreds of owners declare that building the Heath Parasol is a complete aviation course in itself.

2. CAN I FLY IT?

The Heath Parasol has been designed for beginners to fly. Its extremely low landing speed and complete visibility make it the ideal training ship. It is so inherently stable that experienced flyers land it with hands off the controls.

3. CAN I AFFORD TO OWN IT?



Less than one cent a mile is the complete flying cost of America's most popular sport plane! Note how easily it can be transported from place to place. Note also that it needs no hangar as it can easily be stored in a garage as shown here.

$12.00 starts you building this great little plane!

"Can I build it, can I fly it, can I afford to own it?"—these are the 3 big questions which light plane fans ask about the famous Heath Parasol, first place winner at the National Air Races for 5 consecutive years. And out of the experience of hundreds of Heath owners—comes an enthusiastic "yes" to all 3 questions.

Anyone can build the Heath Parasol! You need no technical experience. 22 years of refinement have made Heath plans easy for even the unskilled to follow.

Likewise, anyone can fly this great little plane. It lands at the remarkably low speed of 28 miles per hour. Stops within 30 feet of landing. Even flyers with little experience quickly fly it with ease.

Low Flying Cost

Consider its performance! It flies 40 miles on a gallon of gas. Safely carries a 300 lb. load. Cruises over a 400 mile radius. Races along at an 85 mile per hour top speed. And all this at a total flying cost **less than 1 cent a mile!**

For only $12 you can start building this great little plane NOW. Complete parts cost only $199. They may be purchased in 11 convenient progressive groups. Or you can buy the Parasol ready to fly for only $975. Let us tell you more. Without obligation—mail the coupon below today.

Heath Aircraft Corporation, Dept. M631, 1721-9 Sedgwick St., Chicago, Ill.

Without obligation—please send me your large illustrated booklet. I enclose 10 cents for postage. I am particularly interested in:

☐ Building the Parasol for $199.
☐ The complete Parasol for $975.

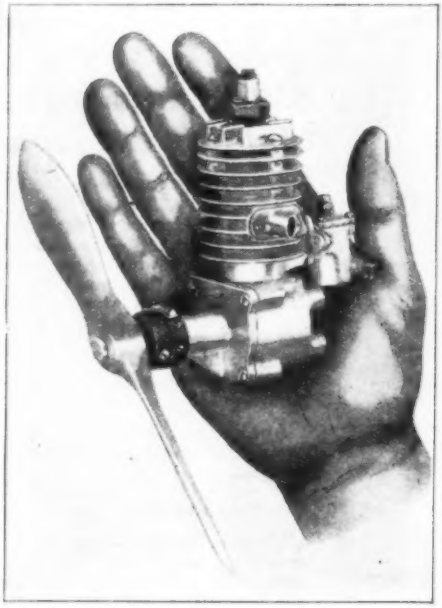
Name .....

Address .....

City ..... State .....

HEATH
AIRCRAFT CORP. CHICAGO

AERO—MIDGET



Our latest model aeroplane gasoline engine weighs about 16 oz. Think what this means for your model plane!

Our Aero-Midget is small, compact, well-built, and designed primarily for model aeroplanes. The above illustration will give you an idea as to its extreme smallness when compared with an average sized man's hand. It starts easily and runs smoothly. Each engine is thoroughly tested before it leaves our factory and carries our factory guarantee.

FREE Blueprints

for the construction of a model aeroplane are given with every engine purchased.

Made by the manufacturer of the famous Aero-Ace and Aero-Lite model aeroplane engines.

The Aero-Midget is Extremely Low Priced.

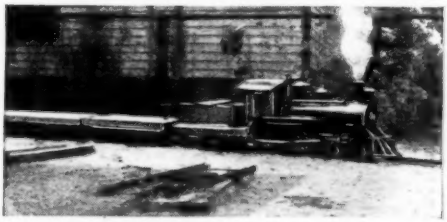
Four cents in stamps will bring you full information and particulars.

GIL MANUFACTURING CO.
Aviation Dept.
3408 N. Cicero Ave., Chicago, Ill.

ANDY'S SHOP MAIL BOX

(Continued from page 34)

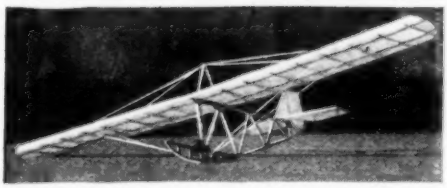
AND now we'll turn from model homes to model railroads. If the artist had painted out the background I would be able to tell you that the picture below showed a Robbinsdale and Anoka train pulling up to the hangar with a load of fan mail.



This model locomotive, built by W. C. Glass, of Atlanta, Georgia, carries 145 pounds of steam. The engines and cars have automotive couplings of original design. The model weighs 500 pounds.

Any readers interested in building model locomotives are invited to write to Manley Mills, 1309 S. Main St., Anderson, S. C. All right, Mr. Mills, you brought this on yourself. I hope you don't run out of stamps.

And while we're on the subject of models, there's a pic below of a nice piece of work by Mortimer Rosenbaum, of Plainfield, N. J.



Here we have a 32-inch scale model of a Rhon Ranger glider recently built by Mort Rosenbaum.

HERE'S a letter which is typical of many I have received since the Pietenpol job was published:

Twin Falls, Idaho.

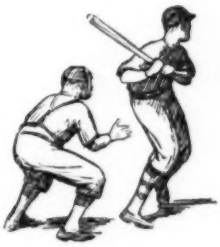
Howdy Andy:

I'm all up in the air about the "Camper," and so the questions—

Why couldn't a fellow use some of these cheap Velie and Le Blond, 60 horsepower motors?

(Continued on page 38)

We'll GIVE you this BASEBALL Special Friendship Offer!



12 thrilling issues!

IT'S a regular wow! A sure enough big time ball which we give to every one who answers this advertisement. The City League is a lively ball, regulation size and weight, 5 oz. and 9 in. Has a solid rubber center, with a highly compressed felt and rubber core, tightly wound with fine quality yarn. Finish winding is of Sea Island cotton. Genuine alum tanned horsehide cover, hand sewn with extra strong red and blue thread. A ball that keeps its solidity, retains its shape and stands up a long time under hard service. Made by The Draper-Maynard Company, makers of quality sporting goods for generations. Clip the coupon, fill in your name and address, pin $1.00 to it, and mail it TODAY! Your ball will be sent immediately postpaid, and you will also receive The Open Road for Boys for one year.

THE OPEN ROAD FOR BOYS has 50 pages or more every month crammed with stories of aviation, sports, school, business and ranch life, high adventure on land and sea, mystery and daring. Great book-length serial stories, interesting articles, jokes and humor, International Correspondence Club, stamp department, and THE OPEN ROAD PIONEERS—nation wide club for boys. Contests galore for all. Not a page is wasted, each one filled with action, mystery, thrills.

Big Leaguer
130 Newbury St.,
Boston, Mass.

This offer good only in the United States.

Here's My Dollar. Rush regulation baseball at once, Postpaid, and send me Open Road for Boys for a whole year.

Name .....

Street .....

City ..... State .....

"How I Licked Wretched Old Age at 63"

I Quit Getting Up Nights — Banished Foot and Leg Pains . . . Got Rid of Rheumatic Pains and Constipation . . . Improved My Health Generally . . . Found Renewed Strength

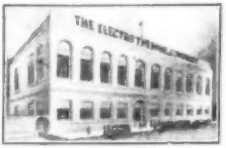
"At 61, I thought I was through. I blamed old age, but it never occurred to me to actually fight back. I was only half-living, getting up nights . . . constipated . . . constantly tormented by aches and pains. At 62 my condition became almost intolerable. I had about given up hope when a doctor recommended your treatment. Then at 63, it seemed that I shook off 20 years almost overnight."

Forty—The Danger Age

These are the facts, just as I learned them. In 65% of all men, the vital prostate gland slows up soon after 40. No pain is experienced, but as this distressing condition continues, sciatica, backache, severe bladder weakness, constipation, etc., often develop.

PROSTATE TROUBLE

These are frequently the signs of prostate trouble. Now thousands suffer these handicaps needlessly! For a prominent American Scientist after seven years of research, discovered a new, safe way to stimulate the prostate gland to normal health and activity in many cases. This new hygiene is worthy to be called a notable achievement of the age.



A NATIONAL INSTITUTION FOR MEN PAST 40

Its success has been startling, its growth rapid. This new hygiene is rapidly gaining in national prominence. The institution in Steubenville has now reached large proportions. Scores and even hundreds of letters pour in every day, and in many cases reported results have been little short of amazing. In case after case, men have reported that they have felt ten years younger in seven days. Now physicians in every part of the country are using and recommending this treatment.

Quick as is the response to this new hygiene, it is actually a pleasant, natural relaxation, involving no drugs, medicine, or electric rays whatever. The scientist explains this discovery and tells why many men are old at forty in a new book now sent free, in 24-page, illustrated form. Send for it. Every man past forty should know the true meaning of those frank facts. No cost or obligation is incurred. But act at once before this free edition is exhausted. Simply fill in your name below, tear off and mail.

THE ELECTRO THERMAL COMPANY
3842 Morris Ave. Steubenville, Ohio.

If you live West of the Rockies, address The Electro Thermal Co., 303 Van Nuys Building, Dept. 38-V, Los Angeles, Calif. In Canada, address The Electro Thermal Co., Desk 38-V, 53 Yonge St., Toronto, Can.

THE ELECTRO THERMAL CO.,
3842 Morris Ave., Steubenville, Ohio.

Name .....

Address .....

City ..... *State* .....

ANDY'S SHOP MAIL BOX

(Continued from page 36)

And according to the picture of it, the wing struts are spread out like the old Parasol. Why not change them to the V type like Heath did? And, of course, there is the split axle landing gear and several other improvements.

Sincerely,
ELBERT L. FARRAR.

Well, in the first place, Elbert, this is the Pietenpol Camper, and if it were not built like the Pietenpol Camper it would be something entirely different. B. H. Pietenpol built this ship from his own original design, and it flies like a homesick angel. We bought the plans just as they were because we liked the way the ship performed and believed it to be just what the fans wanted.

Now it's Okay with me if you power your own ship with a Velie, Le Blond, Maytag washing machine motor, or a Pratt & Whitney Wasp. You're paying for the ship you build, and can do anything you want to with it. Our plans, however, specify a converted Model A Ford engine. The reason we specify this engine is because the ship was built around it and flies just right when so equipped.

Now, this plane might fly O. K. with the motors about which you ask, and it seems quite probable that it would. In fact, Mr. Pietenpol powered one of his models with the Velie motor. If you want to experiment, go right ahead, but don't blame me if the ship doesn't fly.

We're rather conservative concerning the structural changes. Some fellows want to make this into a mid-wing job and even into a biplane. That's also Okay with me, but you won't be building the Pietenpol Camper, and I won't guarantee you any performance with any changes whatever. If you ask me, I'll tell you to follow the plans. My opinion is, that if you fellows had the engineering ability to make these changes you wouldn't ask me in the first place; for remember, I'm only a grease monkey and never studied aero-dynamics.

EVER since I printed that photo of George Robertson's water wind wagon in the February issue, I've been on the receiving end of a flock of questions regarding the construction of these water babies.

I might as well tell the rest of the gang what I've been telling my letter writing fans —The best thing we can offer you in this line

(Continued on page 40)

Hey! Buddie! "Join me working for Uncle Sam!

I Make $2700 a Year as Railway Postal Clerk

"$2759.00 to be exact. That's $53 a week. And listen! Here's what makes it so *good*—I make it *every* week! The year round! Before I landed this government position I thought I was a *lucky boy* if I wasn't out of a job at least 6 or 8 weeks a year. Never *could* keep any savings in the bank. *Now* I can positively count, in advance, on getting every dollar of my year's pay. And I'm just as sure of my regular raise every year too. No 'pull' or 'boot-licking' needed to get it either!

No More Worry About Layoffs

"I figure that I'm all through looking for a job. I'm sitting pretty. I sure can plan my future, because my income from Uncle Sam is *definite and certain*. He's the *right* boss to have when private business is laying 'em off right and left!

I Get Vacations and Sick Leave With Pay

"15 days' vacation a year, and 10 days' sick leave. *My pay goes right on.* That's a plan that sure makes a hit with us Railway Mail Service boys.

Patterson's Help Made It a Cinch

"I mean Arthur R. Patterson, of Rochester. He helped me get this berth. He used to be one of Uncle Sam's Civil Service Secretary-Examiners (for eight years)—so he knows all the ropes —just the kind of questions you get asked in the exams. He's helped thousands into fine Government positions. He helped me to get a *high* rating—so I could get appointed in just a short while.

He'll Help You Too

"Listen to me! I don't know you personally—but if you are a U. S. CITIZEN (anywhere between 18 to 50 years old) and want a sure, *safe job*—with *good and regular pay*—then I say, 'Write for Arthur R. Patterson's FREE BOOK!' In it he tells just how you can qualify for the *very government job you want*—Railway Postal Clerk (like me), Post Office Clerk, City Mail Carrier, Rural Carrier, Postmaster, Customs Service, or any other branch you fancy. Write Arthur R. Patterson, 'Civil Service Expert.' I'll say he is—and his advice won't cost you but two cents. Just mail him the coupon. He'll do the rest."

ARTHUR R. PATTERSON, *Civil Service Expert,*
434 Wisner Bldg., Rochester, N. Y.

Pick Your Job!

Patterson Helps You Get It or You Don't Pay a Cent!

RAILWAY POSTAL CLERK
$1850 to $2,700 a year. Extra travel pay.

POSTOFFICE CLERK
$1,700 to $2,100 a year. Special clerks at $2,300 and $2,800. Eligible to promotion to higher paid positions.

CITY MAIL CARRIER
$1,700 to $2,100 a year. Promotions to bigger pay.

R. F. D. MAIL CARRIER
$1,800 to $2,600 a year. Fine job for men in rural districts.

POSTMASTER
$1,200 to $2,500 a year. A position that can be made very profitable in small towns.

INTERNAL REVENUE AND CUSTOM HOUSE POSITIONS
$1,140, $1,680 to $3,000 and up a year. Extra pay for overtime.

DEPARTMENTAL CLERKS
$1,440 to $1,620-$1,860 a year and up to $3,000 a year. Work in Washington.

IMPORTANT—Get ready NOW for the next Railway Postal Clerks Examination!

Patterson prepared US to win- Now YOU get his FREE BOOK!

Another Quick Appointment
"Received my rating from the Railway Mail Clerk exam. I passed and received my blank oath from Peoria to report for work. I could not have done so well without your training."—**James M. Wright, Chatsworth, Ill.**

Tell Others About My Help
"Just a line to let you know that I was appointed a Railway Postal Clerk. Am assigned to the Chief Clerk at Peoria, Ill. I like the work fine. Also, am sending a few names of persons who might take up a course."—**Michael Reiss, Ramsey, Ill.**

Speedy Appointment as Postal Mail Clerk
"Received my rating from Commission Nov. 18, in the Railway Mail examination. Four days later, Nov. 22, I received my appointment as clerk. I stood No. 27 on the list in this state. I certainly can recommend your school whenever I have occasion to do so. My advice to any prospective student is to enroll with 'one who knows'."—**Wm. R. O'Kelly, Fleischmanns, N. Y.**

Arthur R. Patterson, Civil Service Expert,
PATTERSON SCHOOL,
436 Wisner Building, Rochester, N. Y.

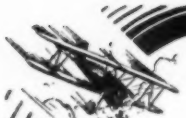
Dear Mr. Patterson:

Send me your 32 page FREE BOOK telling how I can secure a position with the U. S. Government paying from $1850 to $3300 a year. This request doesn't obligate me in any way.

Name .....

Address .....

City ..... State .....



FREE BOOK

Every FLO Student Receives ....

Monoplane · Biplane · Cabin and Whirlwind Training..

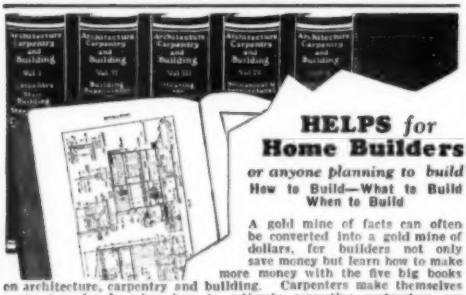
Here's real news for aviation students. Every Flo student — even private pilots — receives monoplane, biplane, cabin and Whirlwind training. Think what this extra time—extra experience—will mean when you go out to fly. Come to Detroit to learn aviation where Lockheed, Ryan, Stinson, Buhl, Verville, Eastman, Ford ships and Packard Diesel, Warner and Continental aircraft engines are built. Every Flo flying student receives a complete Transport ground course. Many advantages, ideal surroundings, low living expenses.

Big Catalog FREE

Send at once for our big illustrated catalog that tells you all about the Flo college, the many advantages of Detroit, and shows many pictures of Flo activities.

LEONARD FLO AIR COLLEGE
Dept. 6
Dearborn (Detroit Suburb)
Michigan

WRITE TODAY



HELPS *for* **Home Builders**

or anyone planning to build

How to Build—What to Build When to Build

A gold mine of facts can often be converted into a gold mine of dollars, for builders not only save money but learn how to make more money with the five big books on architecture, carpentry and building. Carpenters make themselves contractors by learning how to estimate correctly; contractors are able to handle bigger and more profitable jobs by learning how the big fellows do it. Men who want to build homes can save money by learning how it should be done. The new **Jiffy Index** puts before your eyes without wasted time, the things you want to know. Nothing has been overlooked. Use of tools, building construction, heating, lighting, plumbing, architectural drawing; all fully covered. We will include with the five volumes above, at the special reduced price of only $19.80 (easy payments) a handsome book, "Blueprint Reading." 120 pages, full of diagrams, etc., without extra charge.

No Money Needed—Don't Send a Penny

You take no chance of any kind. Just send us your name and address on the coupon and we will ship the complete set of five big volumes, 2,400 pages, without a penny of down payment. Look them over, find out anything you want to know and then, at the end of ten days, if you want to keep them, send only $2.00. After that send only $3.00 per month until the special price of only $19.80 has been paid. (Former price, $24.80.)

FOR FREE OFFER USE COUPON

American Technical Society, Dept. G-A320,
Drexel Ave. at 58th St., Chicago, Ill.

I would like to look at the five books described above. Send them on your free offer. I will examine them thoroughly and return them in ten days unless I like them, in which case I will send you $2.00 and after that $3.00 per month until the special price of only $19.80 is paid. You are also to send me your book, "Blueprint Reading," without extra charge.

Name .....

Address .....

Employer's Name & Address .....

ANDY'S SHOP MAIL BOX

(Continued from page 38)

is to recommend that you build the Heath Seaplane Parasol and leave off the wings. We hope to have Westy Farmer draw us up some plans of such a bus, but it will be several months before these are ready, if at all. In the meantime you might be interested in the following letter:

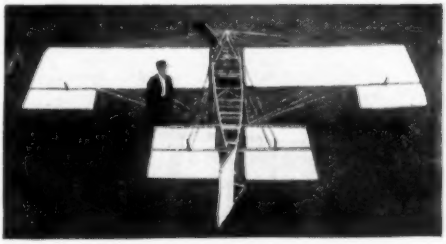
Dear Sirs:

In the February Modern Mechanics and Inventions you published a letter in Andy's Shop Mail Box from a Mr. George Robertson, of Brooklyn, N. Y., in reference to an air-drive boat that he had built.

I wrote to Mr. Robertson, and we soon got together and had quite a talk on the possibilities and speed of air-drive boats. The results of this talk was that I am to design him an air-drive boat around a Ford "A" motor, which will have a speed of 60 m.p.h. This boat will probably be ready for speed test in the spring of 1932.

At the present time we do NOT have any data or pictures to give out. However, we will send you some pictures at a later date. We do NOT have any plans for this boat for sale at this time. If this boat is successful we may be able to furnish plans to those interested. If this is a success we plan to build a twin motor boat with about 360 h.p. that will give real speed.

Yours Respt.
OWEN EVANS.
558 14th St. S. E., Washington, D. C.



This airplane is still in existence, and so is the fellow who buillt and flew it away back in 1910, when aviation and suicide were considered synonymous.

IT OCCURRED to me, when I received the following letter, that you fellows would like to hear from one of the daddies of this here light plane racket. If I'm right, you'll find the message immediately below:

Spring Lake, Michigan.

Gentlemen: (He means the editors)

I am enclosing a photo of a plane constructed in the year 1910. This picture was

(Continued on page 44)

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AVIATION

☐ Aviation Engine Examiner

By Major Victor W. Pagé. Aviation engines explained in simple questions and answers. Prepares you for job as aircraft engine mechanic; valuable to pilots and students. Describes all types aviation engines, parts and construction, principles of operation, with instructions for engine inspection, installation, trouble shooting, overhauling and repair. Compact, condensed, simplified. 400 pages, 250 illustrations. **Price, $3.00.**

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A brand new book on motorless flying. Explains everything about this popular sport; all types of Gliders and Sailplanes, construction, control and launching; principles of gliding, soaring, air currents, etc. Instructions for building simple Glider, with WORKING DRAWINGS. How to form a Glider Club, etc. 200 pages, 70 illustrations. **Price, Paper Binding, $1.50; Cloth, $2.00.**

☐ Modern Aircraft

By Major Victor W. Pagé. Covers all types of American and foreign airships, airplanes, and engines, design and construction, with complete instructions for operation and maintenance. Nineteen practical chapters. Used in 200 schools. 855 pages, 400 illustrations, 23 tables. **Price $5.00.**

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By Major Victor W. Pagé. Most complete treatise on all types of aircraft motors ever published. Describes, explains, illustrates **every type of aircraft motor**—installation, repairs, maintenance. Two great volumes, 1000 pages, 500 illustrations in each. Vol. 1 covers principles of aviation engines, engine parts and functions, construction, trouble shooting, etc. Vol. 2 gives detailed descriptions of all leading makes of airplane and airship engines of today.
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(With special 25x38-inch Trouble Shooting Chart **$5.25.**)

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CIGARETTE MAKER

Roll your own and save money. Better and quicker; saves more than half. Use your favorite brand of tobacco. Neat, useful, handy. Pocket size, weighs ½ oz. Made entirely of metal, nickel plated. 35c, 3 for 95c.

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Box contains ten genuine cigarettes of excellent quality. They appear so real, but when each cigarette is about one-third smoked, the victim gets a very great surprise as it goes off with a loud BANG! A great mirth provoker yet entirely harmless. Price 25c box

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Two very novel metal badges, nickel plated, that you can wear, giving you fun out of all proportion to their trifling cost. 10c, each badge. 3 for 25c, or 75c per doz. postpaid anywhere.

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With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. **Prices, postpaid: 40 Bills 20c, 120 for 50c, or $3.50 thousand postpaid.**

NOSE FLUTE

Post Paid 10c

The Magic Nose Flute, or Eunaxatone, is a unique and novel musical instrument that is played with nose and mouth combined. There is just a little knack in playing it which, when once acquired after a little practice, will enable you to produce very sweet music that somewhat resembles a flute. There is no fingering, and once you have mastered it you can play all kinds of music with facility and ease. When played as an accompaniment to a piano or any other musical instrument, the effect is as charming as it is surprising.

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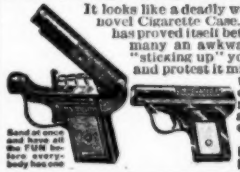

Send at once and have all the FUN before everybody has one

PRICE POSTPAID 25c

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Strongly Made. Equipped with Mirrors, Sight-Finder and Eye-Piece.

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The most confidential messages can be written with this ink, for the writing **makes no mark.** Cannot be seen unless you know the secret. Invaluable for many reasons. Keep your pocketbook and other private memorandums away from prying eyes. Great fun for playing practical jokes. **Only 12c a Bottle; 3 for 40c.**

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25 Cents

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Most remarkable toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table and then placing it down, it will crawl along, overcoming all obstacles, in the same life-like manner as the larger Tank that proved so deadly in the great war. What makes it go is somewhat of a mystery, for there is no mechanism to wind up as is usually understood with mechanical toys, yet this tank will keep plodding along ten times longer than the ordinary run of toys. It will perform dozens of the most wonderful stunts; 2½ inches long. **Price only 25c prepaid. Stamps accepted.**

JOHNSON SMITH & CO.

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ANYONE CAN DO THEM

It is great fun mystifying your friends. Get this Conjurer's Cabinet, and you will be the cleverest fellow in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BALL AND VASE TRICK (a wooden ball is placed inside, and upon replacing the lid has disappeared and is found in someone else's pocket); The HINDOO TRICK CARDS (can be made to change completely no less than five times); DISAPPEARING COIN BOX (a coin, placed in the wooden box, vanishes entirely or changes into a coin of another denomination); The GLASS GOBLET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else); the RIBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons comes out of your mouth); the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes); the WIZARD'S RING COIN TRICK; the ENCHANTED BOTTLE (no one but yourself is able to make it lay down); the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath yet no one has touched the hat), and last, but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above, a number of other feats and illusions are fully explained for which you can easily make or procure the necessary apparatus. **Price complete $1.00 postpaid. JOHNSON SMITH & CO.**

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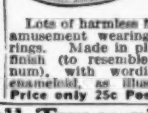
An excellent little book containing 250 Parlor Tricks, tricks with cards, coins, handkerchiefs, eggs, rings, glasses, etc. So simple that a child can perform them. Profusely illus. Sent postpaid to any address for only 10c, 3 copies for 25c.



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Lots of harmless fun and amusement wearing these rings. Made in platinoid finish (to resemble platinum), with wording on enamelloid, as illustrated. **Price only 25c Postpaid.**

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Cleverly performed feats of conjuring, sleight-of-hand and illusion interest everybody, and ability of the kind always makes one a welcome guest. This is a book of 96 pages, with nearly 100 illustrations. The instructions for performing are so plainly given that even a child, with a little practice, can do them, so they only require SIMPLE APPARATUS. The book gives full and clear explanations of an unusually large number of clever tricks of all kinds, and a glance at the partial contents given below will give you a very good idea as to the comprehensive nature of this book. In addition there is a chapter on "SECOND SIGHT," a combination of five different methods which baffle the most astute investigators. The book is well worth the while even for those who merely wish to know how the tricks are done, while for the amateur magician it is a perfect treasury of golden opportunities.

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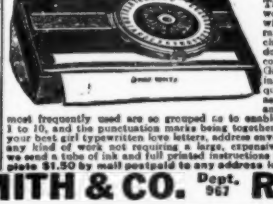
Magic for the Amateur Magician..... Price 25c Postpaid

The "Little Giant" Typewriter

A First Class Writing Machine For $1.50



A perfect little typewriter for $1.50. There are thousands of persons who would like to have a typewriter but whose needs and business do not warrant the expense attached to the purchase and use of a fifty or seventy-five dollar machine. To such persons we confidently recommend our Little Giant. It is strongly made, but simple in construction, so that anyone can quickly learn to operate it, and write as rapidly as they would with pen and ink. The letters of the alphabet most frequently used are so grouped as to enable one to write rapidly, the numerals 1 to 10, and the punctuation marks being together. With this machine you can send your best girl typewritten love letters, address envelopes, make out bills, and do almost any kind of work not requiring a large, expensive machine. With each typewriter we send a tube of ink and full printed instructions for using the machine. **Price complete $1.50 by mail postpaid to any address in the world. Stamps accepted.**

Send remittance (Postage Stamps accepted) for all articles listed above, also in our other ad on previous page

JOHNSON SMITH & CO. Dept. 967 Racine, Wis.

EXPO Watch Camera

Send Only **$1** with order for COMPLETE OUTFIT

Complete Outfit, $5.00. Send $1 with order. Pay postman the balance upon receipt of outfit.

Here's the greatest little camera made! A novel and valuable possession that will give you loads of fun for years to come. Fits right into your vest pocket. **You can take pictures without being detected.** Looks exactly like a watch, only it is a trifle larger. Weighs but 3 ounces. Pictures are taken through the stem, where the rapid-fire little lens is located. A well made and finely finished instrument.

Takes pictures ⅝x⅞ of an inch (sharp negatives), which may be enlarged to 3¼x5½ inch size. Loads in daylight with a film of 20 exposures. Shutter has time and instantaneous speeds. Some of the leading newspapers of the country have scored important news "beats" with the aid of the Expo Watch Camera.

Complete outfit includes camera, with brilliant view finder, and 20 exposure film. Total price only $5.00. Send only $1.00 with order. Pay postman the balance upon receipt of outfit, plus few cents postage. Don't delay—send $1 today!

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Handles like putty . . . hardens into wood Looks like wood. It *is* wood . . . Plastic Wood you can mould with your hands and make and mend 1,001 things. It's waterproof, weather-proof, wear-proof. Send for interesting 48-page book that tells what you can do with Plastic Wood. IT'S FREE.

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Send me—free—big, illustrated book of uses for PLASTIC WOOD.

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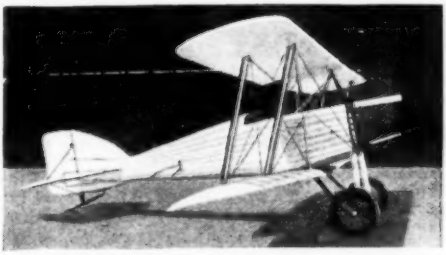
ANDY'S SHOP MAIL BOX

(Continued from page 40)

taken in the Notre Dame Gym in 1910. This plane is no doubt the first monoplane in the United States with motor in front.

I originally equipped it with a two-cylinder air-cooled motor of thirty horsepower. I afterward constructed the fuselage to accommodate an eighty horsepower water-cooled motor, and made a number of successful flights with it through the years 1911 and 1912. I cracked up in South Bend in 1912. This plane weighed 780 pounds with the 80 horsepower motor.

Yours very truly,
P. M. BOECK.



A biplane designed and built by Richard B. Lothrop, of Oakland, California. The ship will be powered with a 6-cylinder, 45 H. P. Anzani.

I've received several loud and delighted whoops of approval in regard to my New Year's resolution not to talk so much; and on the other hand, I have been more or less severely condemned for such a stand. This is typical:

Joppa, Tenn.

Dear Andy:

Don't get it into your head that us fellows want nothing but letters from other readers in your column. I take M. M. every month, and I don't think there is another mag like it, especially your column before you made that foolish resolution.

From the letters of a few it appears that you might get disheartened from the way they talk about you. I like the way you describe things better than any way.

Of course, I like letters, but don't cut your talk out.

Yours truly,
CLAUDE WHITE.

Now just what is a fellow supposed to do? Suppose we compromise. I'll print a lotta letters or else shoot you a lot of my own sweet line, just depending upon how I feel about it. If I'm lazy, I'll let you do the work, and if my conscience bothers me when I get my check (sure I get paid for this), I'll make you wade through a lot of my prop wash. But no more this month.

"I'll PROVE in Only 7 Days that I Can Make YOU a New Man!"

No other Physical Instructor in the World has ever DARED make such an Offer

Chas. Atlas: As He Is Today.

By CHARLES ATLAS
Holder of the Title:
"The World's Most Perfectly Developed Man"

I HAVE proved to thousands that my system of building powerful, big-muscled men begins to show real results *in only 7 days*—and I can prove it to *you*.

You don't have to take my word for it. You don't have to take the word of my hundreds of pupils who have added inches to their chests, biceps, necks, thighs and calves in only a few days. No sir! You can prove for *yourself*—in just one week—by the change you see and *feel* in *your own body*—that you can actually become a husky, healthy NEW MAN—a real "Atlas Champion."

All I want to know is: Where do *you* want big, powerful muscles? How many pounds of firm flesh do *you* want distributed over your body to fill you out? Where do *you* lack vitality, pep and robust health? Where do *you* want to take off flabby surplus fat?

Just tell me, give me a week, and I'll show you that I can make a *New Man* of you, give you bodily power and drive, and put you in that magnificent physical condition which wins you the envy and respect of any man and the admiration of every woman.

My own system of *Dynamic-Tension* does it. That's the way I built myself from a 97-pound weakling to "The World's Most Perfectly Developed Man." And now *you* can have a big, balanced muscular development like mine in the same easy way.

No "Apparatus" Needed!

You begin to FEEL and SEE the difference in your physical condition at once, without using any tricky apparatus, any pills, "rays" or unnatural dieting. My *Dynamic-Tension* is a *natural* method of developing you *inside and out*. It not only makes you an "Atlas Champion," but goes after such ailments as constipation, pimples, skin blotches, and any other weaknesses that keep you from really enjoying life and it starts getting rid of them at once.

Let Me Tell You How

Gamble a 2c stamp today by mailing the coupon for a free copy of my new illustrated book, *"Everlasting Health and Strength."* It tells you all about my special *Dynamic-Tension* method. It shows you, from actual photos, how I have developed my pupils to the same perfectly balanced proportions of my own physique, by my own secret methods. What my system did for me, and these hundreds of others, it can do for you too. Don't keep on being only 25 or 50 per cent of the man you *can* be! Find out what I can do for you.

FREE BOOK

Where shall I send your copy of "Everlasting Health and Strength?" Jot your name and address down on the coupon, and mail it today. Your own new "Atlas body" is waiting for you. This book tells you how *easy* it is to get, my way. Send the coupon to me personally—

CHARLES ATLAS
Dept. 6F
133 E. 23rd St., New York City

CHARLES ATLAS, Dept. 6F,
133 East 23rd Street, New York City

I want the proof that your system of *Dynamic-Tension* will make a New Man of me—give me a healthy, husky body and big muscle development. Send me your free book, *"Everlasting Health and Strength."*

NAME.....
(Please print or write plainly)

ADDRESS.....

CITY..... STATE.....

Will the Nautilus Freeze

by LEW HOLT

Within a few weeks Sir Hubert Wilkins and his crew of 18 will set forth to burrow under the North Pole in a submarine. Have they any chance of success, or is the expedition foolhardy—are the daring adventurers doomed to die, frozen beneath Polar ice? Read the opinions of experts.

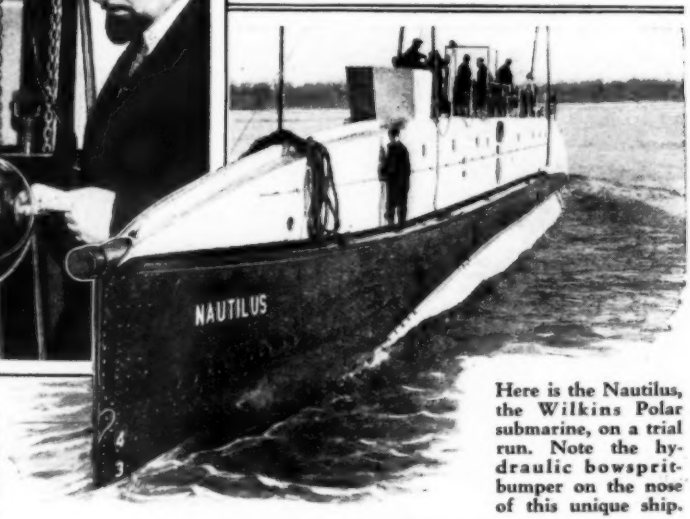
THE most astonishing scientific expedition the world has ever known will get under way early this summer when the submarine *Nautilus*, under command of Sir Hubert Wilkins and Commander Sloan Danenhower, sets forth to burrow under the frozen Arctic seas which surround the North Pole. A puny, man-made whale of steel and iron is issuing a daring challenge to the unexplored wastes of polar ice which already have a grim record for freezing out the lives of scores of fearless adventurers who sought to penetrate the forbidding fastnesses with ship and dog sled.

The purpose of the expedition is to take scientific observations of the Polar sea, to make weather studies, and to chart unknown territory.

Not even Jules Verne, whose seemingly fantastic prediction of the submarine in "20,000 Leagues Under the Sea" has long since become a sober fact, envisioned so daring an underwater expedition as that of Sir Hubert Wilkins. After all, submarines and the men in them must breathe; they must be able to come to the surface now and then for air, and it is possible that the idea of a submarine imprisoned beneath impenetrable depths of ice at the top of the world, buried alive with its crew gasping out their lives as chemically-created air is exhausted, was too fantastic for even Verne's sturdy imagination.

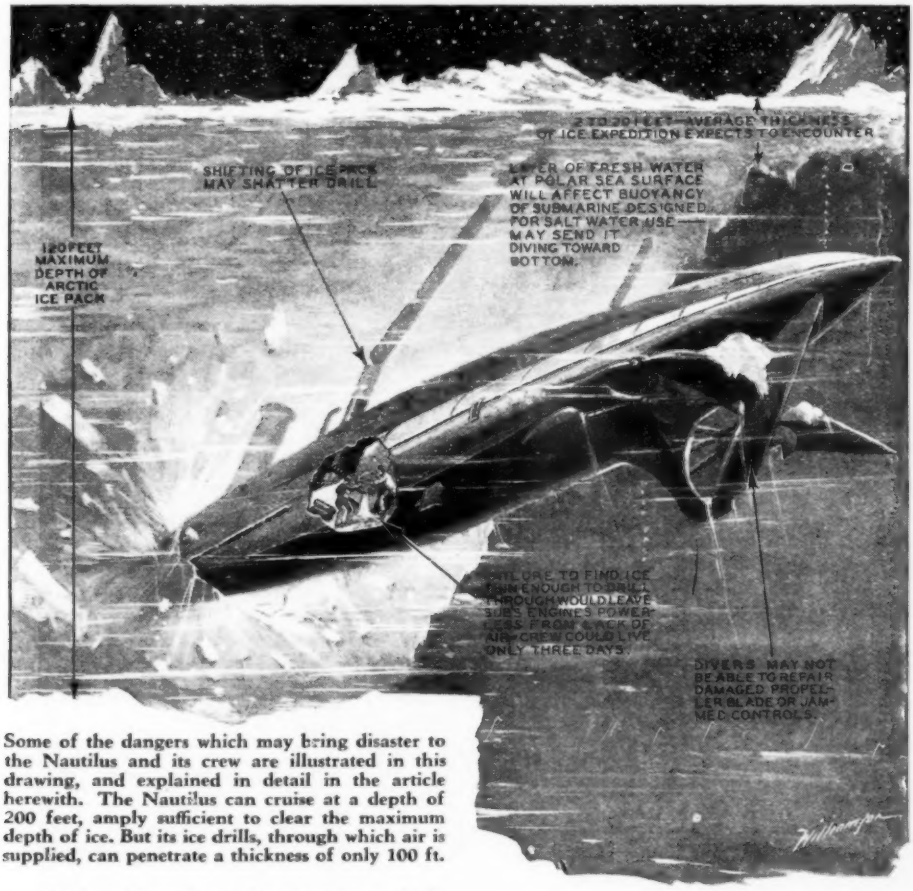
Fantastic, at first glance, the Wilkins expedition certainly is. In fact, to the layman it is more than fantastic—it is suicidal. This opinion, incidentally, is concurred in by many submarine experts of the world's navies, some of whom are quoted later on in this article. Even the sponsors of the trip have admitted the possibility of a great disas-

Commander Danenhower and Sir Wilkins examine special electric bulb which will serve as a giant headlight for their Polar submarine.



Here is the Nautilus, the Wilkins Polar submarine, on a trial run. Note the hydraulic bowsprit-bumper on the nose of this unique ship.

Under the North Pole?


120 FEET MAXIMUM DEPTH OF ARCTIC ICE PACK
SHIFTING OF ICE PACK MAY SHATTER DRILL
2 TO 20 FEET—AVERAGE THICKNESS OF ICE EXPEDITION EXPECTS TO ENCOUNTER
LAYER OF FRESH WATER AT POLAR SEA SURFACE WILL AFFECT BUOYANCY OF SUBMARINE DESIGNED FOR SALT WATER USE—MAY SEND IT DIVING TOWARD BOTTOM.
FAILURE TO FIND ICE THIN ENOUGH TO DRILL THROUGH WOULD LEAVE SUB'S ENGINES POWERLESS FRONT DECK OF AIR-CREW COULD LIVE ONLY THREE DAYS.
DIVERS MAY NOT BE ABLE TO REPAIR DAMAGED PROPELLER BLADE OR JAMMED CONTROLS.

Some of the dangers which may bring disaster to the Nautilus and its crew are illustrated in this drawing, and explained in detail in the article herewith. The Nautilus can cruise at a depth of 200 feet, amply sufficient to clear the maximum depth of ice. But its ice drills, through which air is supplied, can penetrate a thickness of only 100 ft.

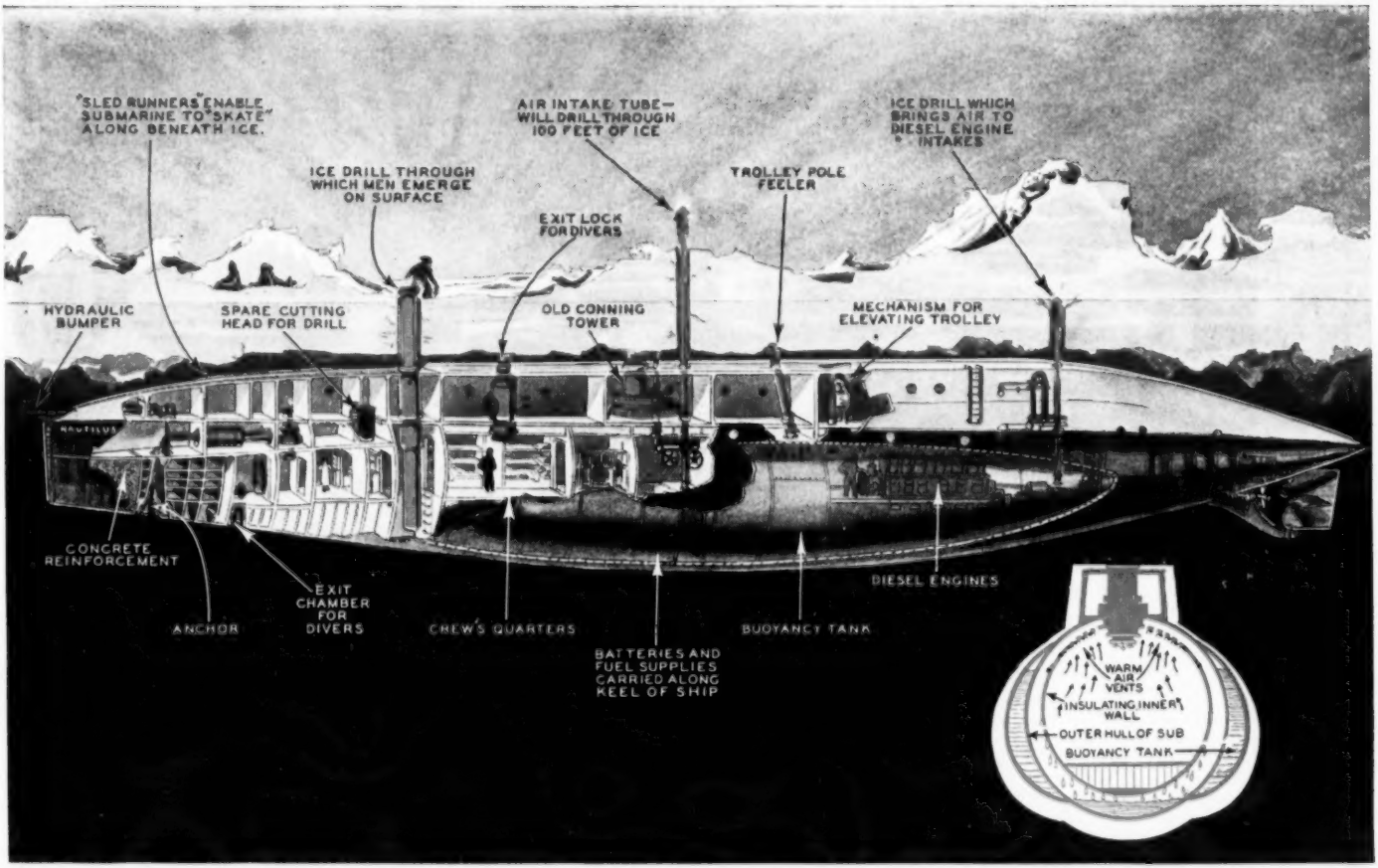
ter which will snuff out the *Nautilus* and all aboard it. Yet every resource of science, every mechanical precaution which ingenuity can devise, is incorporated in the *Nautilus* to protect the submarine from anticipated dangers. The detailed drawing on page 48 shows the arrangement of the novel devices which make the *Nautilus* the most unique submarine in all history. Most of these devices—ice-cutting drills, sled runners, diving chambers, etc.—were designed by Simon Lake, veteran submarine inventor.

What are the dangers which will imperil the expedition? Some of the most obvious are these:

The *Nautilus* may get caught beneath ice so thick that its 100-foot drills could not bore through it; consequently the submarine could not get air, without which the men would perish. Air is also essential to run the Diesel engines used to recharge the batteries which drive the sub under water. For eight hours out of the 24 the sub must lie on the surface recharging the batteries.

The bow of the *Nautilus*, reinforced with concrete though it is, may be damaged by collision with obstacles sufficient to spring a leak and flood the interior.

Batteries may be discharged more rapidly than calculated, leaving the submarine powerless.


"SLED RUNNERS" ENABLE SUBMARINE TO "SKATE" ALONG BENEATH ICE.
AIR INTAKE TUBE— WILL DRILL THROUGH 100 FEET OF ICE
ICE DRILL WHICH BRINGS AIR TO DIESEL ENGINE INTAKES
ICE DRILL THROUGH WHICH MEN EMERGE ON SURFACE
TROLLEY POLE FEELER
EXIT LOCK FOR DIVERS
HYDRAULIC BUMPER
SPARE CUTTING HEAD FOR DRILL
OLD CONNING TOWER
MECHANISM FOR ELEVATING TROLLEY
NAUTILUS
CONCRETE REINFORCEMENT
EXIT CHAMBER FOR DIVERS
ANCHOR
CREW'S QUARTERS
BATTERIES AND FUEL SUPPLIES CARRIED ALONG KEEL OF SHIP
BUOYANCY TANK
DIESEL ENGINES
WARM AIR VENTS
INSULATING INNER WALL
OUTER HULL OF SUB
BUOYANCY TANK

Cross-section drawing of the Nautilus, showing disposition of special devices which will enable the sub to operate in ice-choked seas. In the lower right corner is a diagram showing the method of insulating the walls which keeps the interior of the huge submarine reasonably warm and dry at all times.

Damaged propellers or control surfaces jammed with ice may not be amenable to repair by divers.

The layer of fresh water covering the polar sea, being lighter than the salt water in which the sub is designed to cruise, will not require full ballast tanks to start the ship submerging. If the ballast tanks are not full, the water in them can "slosh" to the forward or rear ends of the tanks, affecting stability and causing the sub to plunge abruptly toward the bottom. Before control can be re-established, in this event, the *Nautilus* will very probably collapse from excessive pressure, since it is designed for depths of not greater than 250 feet.

Shifting of the ice pack through which the submarine's ice drills are boring for air may damage them beyond repair, exerting a "nut cracker" effect.

Areas of open water which the expedition hopes to encounter may not be found when needed.

If caught in an ice pack, the submarine would have no chance to escape.

Navigation, being dependent on observations of moon and stars, is impossible under the ice and the submarine may get "lost."

Submarine may not be successful as an ice-breaker, and may freeze solidly in the ice at the surface while lying there to recharge batteries.

These are a few of the dangers which have been pointed out by submarine experts from all over the world. Not all of them are admitted as actual dangers by the crew of the *Nautilus;* others they have themselves anticipated and taken steps to prevent.

The concrete reinforcement of the bow of the *Nautilus* is expected to protect the sub in case of collision with icebergs or underwater obstacles. Commander Danenhower expects

WHO IS RIGHT?

19 Lives Depend on the Answer

The Wilkins submarine expedition claims that the Nautilus will be able to travel for 40 hours, or a distance of 125 miles, without recharging its battery. Submarine experts at Third Division Naval Headquarters in New York, analyzing the matter exclusively for Modern Mechanics and Inventions, state that a submarine's battery is discharged after an hour's submerged running. On the question of who is right hang the lives of the 19 members of the expedition. Read the opinions expressed in this article.

Conning Tower Drills Through Ice

Men will climb up through a conning tower equipped with an ice-cutting head, as shown above, which penetrates through 13 ft. of ice. The cutting head, a close-up view of which is shown in the inset photograph, is revolved at a speed of eight revolutions per minute. Speed of cutting is 1 ft. a minute.

Nautilus Will Travel from Spitzbergen to Alaska, Bucking Ocean Currents

The route from Spitzbergen to Alaska, shown here, is 2100 miles long, and the trip is expected to be accomplished in 42 days. The small red arrows indicate the direction of the Arctic current, which flows from Alaska toward Greenland. As pointed out by Vilhjalmur Stefansson, famous Arctic explorer, the Nautilus would do better to start its trip at Alaska, rather than ending there as planned, in order to avoid bucking the currents. Icebergs will probably be encountered only in the regions of Greenland, where the sub will be traveling on the surface, and hence can avoid them, as do ordinary ships.

to travel at a speed no greater than a walk when under water; consequently the force of a collision would be negligible under ordinary circumstances. In addition, a hydraulic bowsprit-bumper projects from the nose of the *Nautilus*, acting as a shock absorber.

Ice varying in thickness from two to twenty feet is the average depth expected to be encountered. Two ice drills, one to supply air for the Diesel engines and another for the crew, can drill through 100 feet of ice. A third ice drill, two feet in diameter, is hollow and permits a man to climb through it to the surface of the ice; this one can drill through a 13-foot thickness.

It is claimed that the *Nautilus* can cruise for 40 hours submerged, on one battery charge—a distance of 125 miles. On the other hand, submarine experts have declared that a one hour's submerged cruise is about all that can be expected from a storage battery before recharging is necessary—and recharging must be done at the surface. If the experts are right, the dangers to the submarine will be multiplied many fold. A quartz window in the side of the sub, however, admits light by which the thickness of the ice can be judged, so that the instant the ship comes under a layer thin enough for its drills to pierce, the mechanism can be set in motion.

At the Third Naval Division headquarters in New York City, an exclusive analysis was made for MODERN MECHANICS AND INVENTIONS in which the findings were quite at variance with the specifications published by commanders of the Wilkins expedition. The statement follows:

"The Wilkins expedition commanders are greatly in error regarding the length of the submerged run of which the *Nautilus* will be capable. They are claiming 125 miles for 40 hours. This is preposterous. The submerged run depends chiefly on the batteries for its propulsion and when the juice disappears, the batteries must be recharged with the use of air. The life of a battery is one hour for a complete charge, making a full speed of 11 knots submerged.

"It is the opinion of one of our chief officers

(Continued on page 180)

New Plane Lands at 30 Miles an Hour

This monoplane, recently designed by Earl McClary, of Los Angeles, can land at a speed as low as thirty miles an hour. The location of the motor, the cabin nacelle, and the odd tail beam are of interest.

LANDING his airplane at a rate of only thirty miles an hour is a feat accomplished several times by Earl McClary, of Los Angeles, California. Although this would be nothing unusual for several light planes which have such low wing loading that they are really in the power-glider class, it is a distinctive feat for a four-passenger cabin plane.

The engine of this plane has been installed above the nacelle at the trailing edge of the wing. The empennage is carried on an odd triangular beam.

Sculptor Gets Pose in Half-Minute

THOSE who wish to have their classic profiles excavated from the ruins a thousand years from now, may now secure a sculptured portrait of themselves without posing for hours on end. Only thirty seconds of sitting are now necessary to enable Artist William Fred Engleman to turn out a portrait bust in clay, marble or bronze.

Engleman, who combines science with his art, has invented a special camera which takes five hundred pictures of the model in thirty seconds. The photos are taken from such angles that every detail of the contour of the face and head are revealed.

Here are six of the series of five hundred poses of Miss Dolly Mullan which were taken with the camera sculptor. The completed bust, however, will be far from a mechanical process, as the carving is all done by hand. Above is shown the inventor demonstrating the use of the device at Los Angeles.

"Musiclite" Invention Plays Piano Notes in Color Tones

Philip Grodon, famous pianist, demonstrating his "Musiclite," which makes piano notes visible with the colored light bulbs.

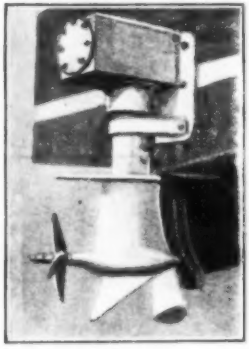
A DISTINCTLY unique invention called the "Musiclite," an instrument which enables you to see sound waves of a note while you are listening to the same tone being played on the piano, has recently been perfected by Philip Grodon, world famous concert pianist.

The device consists of a series of colored lights arranged in openings in a large keyboard attached to the side of the piano, as shown in the photo at the left. These lights are wired to the keys of the regular piano keyboard, so that when a key is pressed to play a note a relay is actuated to light a bulb on a corresponding key on the light keyboard at the side, which is visible to the audience.

New Inboard-Outboard Drive

REPRESENTING a new and highly improved means of motor boat propulsion, an inboard-outboard drive recently invented by Al Nelson, automotive expert, of Los Angeles, Cal., promises to add greatly to the efficiency and ease of maneuvering. The new drive is mounted on the stern of the boat as shown in the photo below, and is connected to the motor, set as near as possible to the stern, by means of a short stub shaft.

The two chief features of the drive are the elimination of both transmission and rudder, the transmission being contained in the drive, and the lower part of the drive acting as the rudder. A pivot arrangement allows the rudder and propeller to tilt upward in case of collision with some obstruction. In changing from full speed ahead to full astern, the throw of a shift lever is all that is necessary.



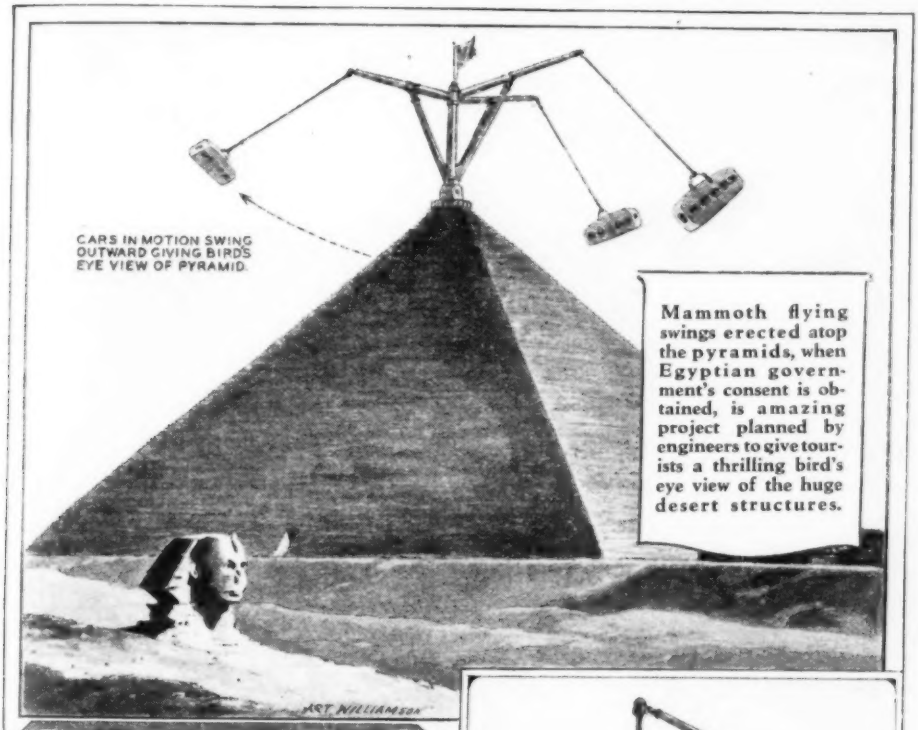
A view of the new inboard-outboard drive, showing transmission and rudder which tilts upward to avoid collision with obstruction.

Ultra-Modern Street Car Seats

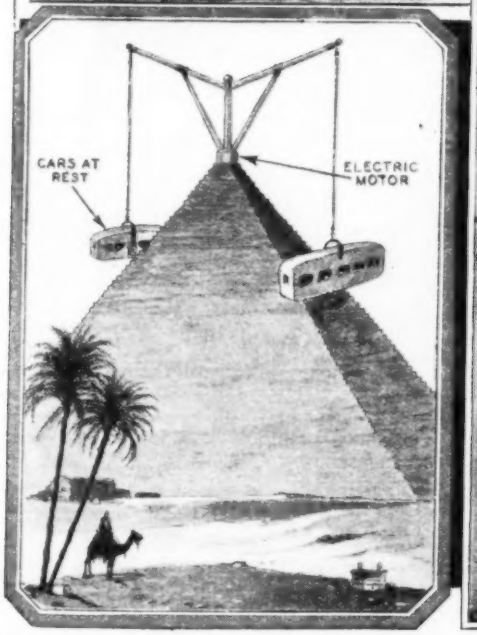
These ultra-modern seats in German street car add to the comfort and convenience of passengers.

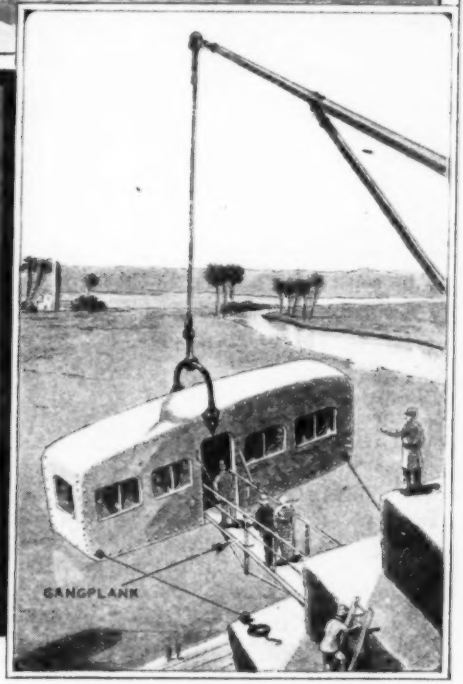
ULTRA-MODERN seats of steel construction, as shown in the photo above, have recently been installed in German street cars. Next to the seats are tables to hold baggage.

Mammoth Flying Swing to Give Bird's Eye Pyramid View



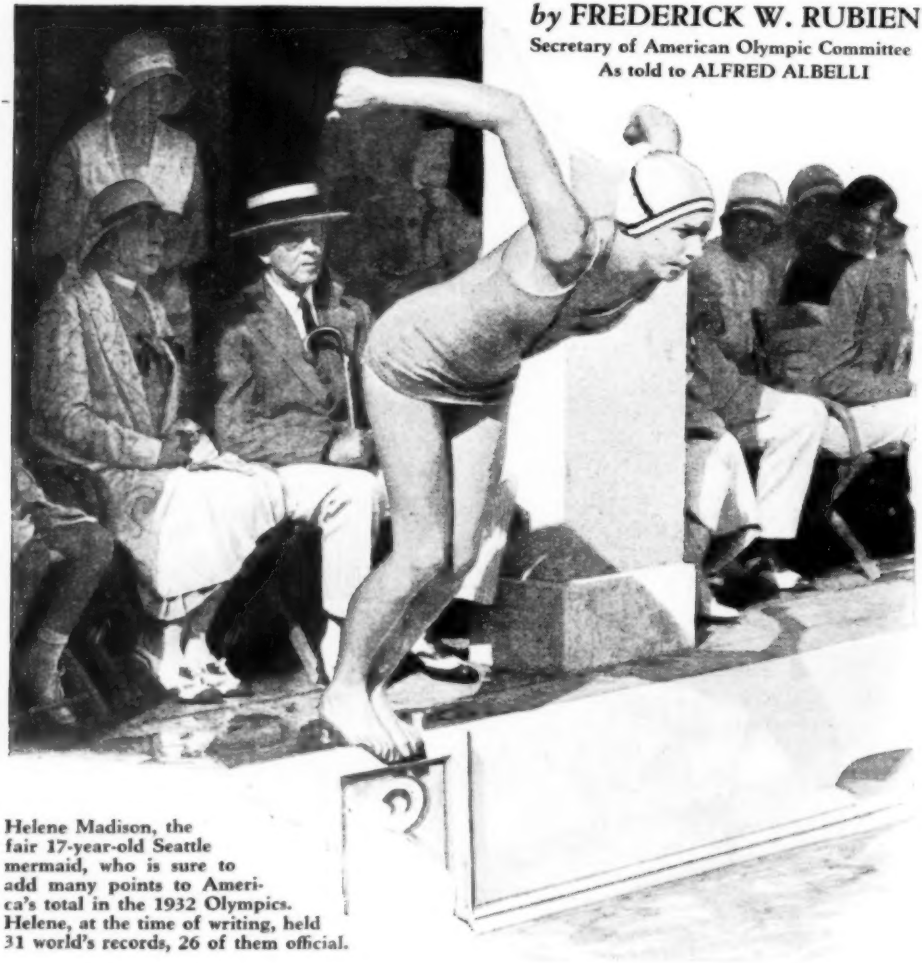
Mammoth flying swings erected atop the pyramids, when Egyptian government's consent is obtained, is amazing project planned by engineers to give tourists a thrilling bird's eye view of the huge desert structures.





SCIENCE *Sets Pace for*

by **FREDERICK W. RUBIEN**
Secretary of American Olympic Committee
As told to ALFRED ALBELLI



Helene Madison, the fair 17-year-old Seattle mermaid, who is sure to add many points to America's total in the 1932 Olympics. Helene, at the time of writing, held 31 world's records, 26 of them official.

WILL sport records ever stop falling? When will human speed, endurance, prowess and ingenuity reach the saturation point in athletic events?

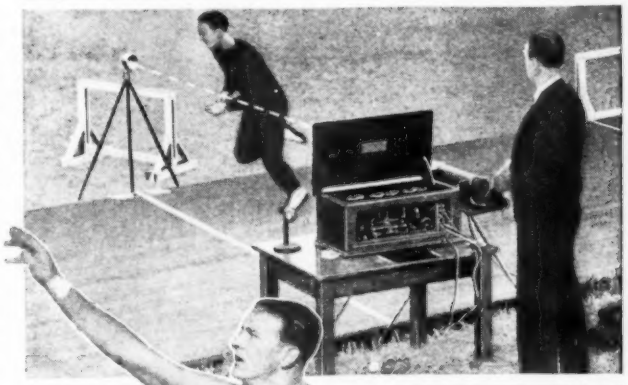
In the past thirty or more years that I have been associated with amateur athletics, I have had those queries facing me constantly. Sport records will never stop falling as long as the spirit of rivalry burns in human hearts.

The vanishing point of record performances will never be reached so long as there are mechanical and scientific minds to devise instruments whereby the athlete's energies and talents are more efficiently utilized.

The sport annals are replete with instances where the athlete's every atom of muscle, skill and vitality have been exhausted, only to have science point the way to new records. The human make-up has not changed, perceptibly at any rate, but science has improved the athlete's tools appreciably during the past twenty-five years.

1932 Olympic Games

Athletic sports are no longer merely a purely physical matter, for science and inventive ingenuity each year bring forth new equipment which enables the trained athlete to clip seconds or add inches to the world's records in all events, until now it is a rare athletic meet when one or more records fail to fall.



Running records may soon be measured in hundredths of seconds by the electric eye timer.

Only last February we saw a record which we supposed might have remained permanent go flitting into oblivion and a new one set up by an obscure dark horse in the indoor high jump event at the Millrose Games in Madison Square Garden.

George Spitz, 19 years old and just out of high school, to the amazement of 15,000 spectators, came out of nowhere and sailed gracefully over a thin and untrembling bar poised 6 feet 7 inches above the take-off. His feat became the world's record, surpassing the mark of Harold Osborn, the college professor-athlete, who hung up a record of 6 feet 6¼ inches back in 1925.

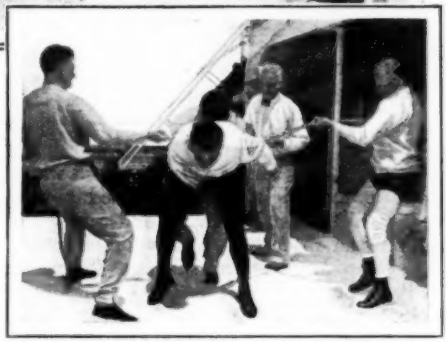
The performance of Spitz is not an isolated one. Hardly a big athletic meet passes these days without some record being annihilated. I happen to know that the remarkable performance of Spitz resulted not only from the wonderful training he underwent, but also from his use of mechanical aids to strengthen his body and muscles.

George Spitz uses two forms of equipment for his training, aside from his major instrument which is composed of the poles and the bar over which he lifts himself. He uses a specially-made gymnasium bicycle with a clock in front of it to register the amount of energy expended. That is for his legs. For his arms he concentrates on a piece of rowing apparatus. It is like the section of a rowing shell, with two oars.

This youth flaring suddenly and spectacularly out of the athletic firmament, promises to be America's best bet at the 1932 Olympics to be held at Los Angeles from July 30 to August 14. The outdoor high-jump mark is 6 feet 8¼ inches, held by Harold Osborn, and although I am not given to predictions, I would not hesitate to say that Spitz could look that one straight in the eye without flinching. Perhaps another dark horse will appear in this event at the Olympics. With science setting the pace these days, there is no telling where a brilliant dark horse is hiding.

Herman Brix, of the Los Angeles Athletic Club, present holder of the shot put record, is a sure point winner in the field events.

The rowing machine which enables oarsmen to keep in condition in winter or when traveling.



The acrobat's practice belt enables divers and wrestlers to keep in practice aboard ship or in the gym. Top photo—Helen Meany using belt.

In the 1912 Olympics at Stockholm, Sweden, Ted Meredith won his place toward posterity by his victory in the 800 meters run. I can still recall vividly how he was tossed into that race as a sort of "work horse" for Mel Sheppard and Ira Davenport, shining luminaries of the day. Meredith wasn't considered a winner by anyone.

To the great astonishment of the multitude, it was noticed that his more illustrious team-mates were being hard pressed. Suddenly, like a flash out of the blue, Ted Meredith spurted ahead to make a record of 1:51 9-10, which remained unassailed until 1928 when D. G. A. Lowe of England clipped a tenth of a second off it.

Johnny Hayes was another famous dark horse. He fell into fame when he beat the celebrated Italian marathoner, Dorando, in the 1908 Olympics. There were at least twenty others in that noted marathon race who outshadowed Johnny Hayes. Some sporting gentleman even thought his entry was a foolhardy move. They said he didn't have a ghost of a show.

But today I know of no more dazzling chapter in the annals of the revived Olympic Games. I cannot recall in all my years of affiliation with sports a more dramatic triumph than that scored by Hayes over Dorando. The Italian baker was the first to reach the stadium. But once on the track there, he collapsed. Several of his fiery countrymen helped him to his feet and hauled him across the finishing line.

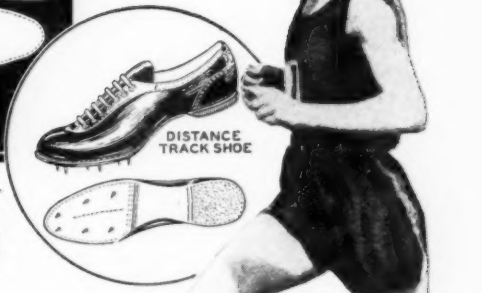
In another second Hayes came dashing into the arena, fresh and peppery under his own steam. He finished strong, to the utter amazement of the bewildered spectators. Dorando was disqualified. Hayes was proclaimed the victor. Since that memorable triumph no other American has ever won that event. We are apt to be optimistic too easily in America, and yet I would not be totally surprised if a dark horse won the marathon for Uncle Sam.

The 26-mile marathons have lost favor with American runners since the days of Johnny Hayes. The gruelling grind does not appeal to our young athletes of the cinder path. Yet every now and then a runner steps out who promises to take the olive-branch in the marathon.

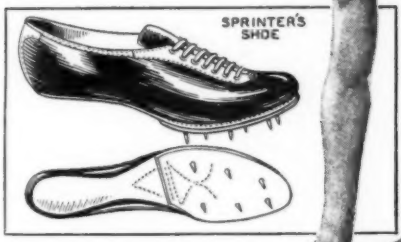
Clarence DeMar, the so-called grandpa of the marathon, whose native heath is Boston, will wind up two decades of foot-racing by taking part in the 1932 Olympic marathon event. Science cannot do much for the long-distance runner beyond the athlete's natural

Perfection of Running Shoes Has Clipped Seconds From the Records

As marathons are run over hard roads, the shoes are not spiked.

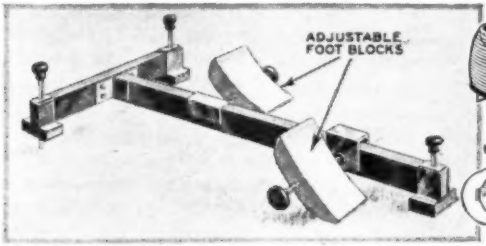


Joie Ray, the first American to finish in the last Olympic marathon. Cross country and marathon runners use a leather shoe with no spikes.



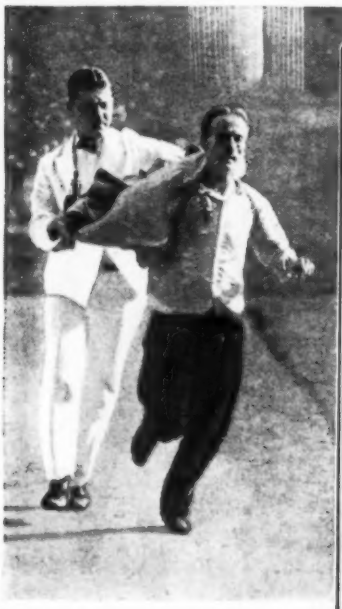
The sprinter uses a shoe of featherweight leather with no heel, as he runs entirely on his toes. At the right is Frank Wykoff, 100-yd. record holder.

Paavo Nurmi, who holds most of the distance records from one to ten miles, and the distance runner's shoe.

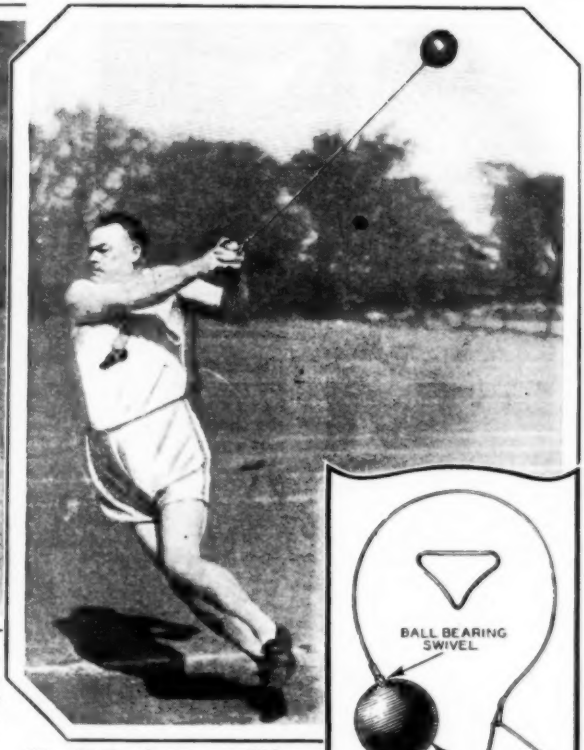


Starters' blocks which helped Simpson to break a record, which was later disallowed. (Information on equipment courtesy the A. G. Spalding Co.)

The baseball shoe of sixty years ago is compared in drawings above with those of the present day.



Clarence DeMar, famous distance runner, subjects himself to tests by Boston scientists to determine the effects of such strenuous exercise.



Matt McGrath, 53-year-old hammertosser and four-time Olympic winner, is still conceded a chance to win in 1932. At the right is shown the modern hammer which enabled McGrath to set the record of 180 ft. 2 in.

attributes of speed and endurance. Mind and body work with faultless mechanical precision. Beyond the co-ordination of these two to their fullest capacity, mechanical aids or scientific treatment cannot go far in helping to set records.

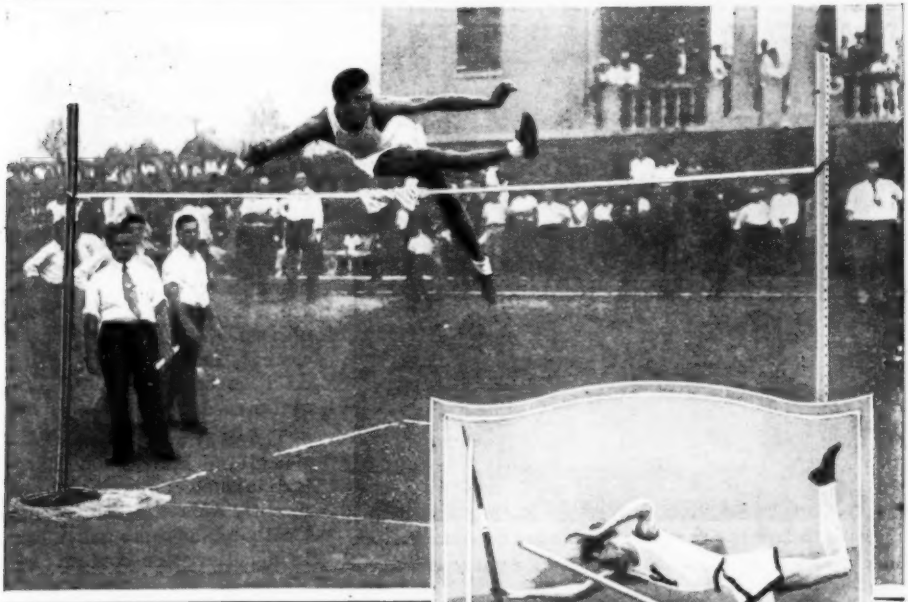
In the pole-vaulting event, science has come bountifully to the aid of the athlete. Not only is there an advantage in the use of a bamboo pole, but also in the matter of the take-off has the vaulter gained advantage through scientific progress.

The ingenuity of sporting guides has improved the hammer throwing event from the crude days when a blacksmith's 12-pound sledge-hammer was used, making a 78-foot throw at the best then, to the present mark of over 180 feet. In the coming Olympics a 16-pound hammer will be used, with a head consisting of a lead or brass shell filled with lead or cast-gray iron and spherical in shape. The handle will be of spring steel wire, and the grip may be either of a single or double loop construction.

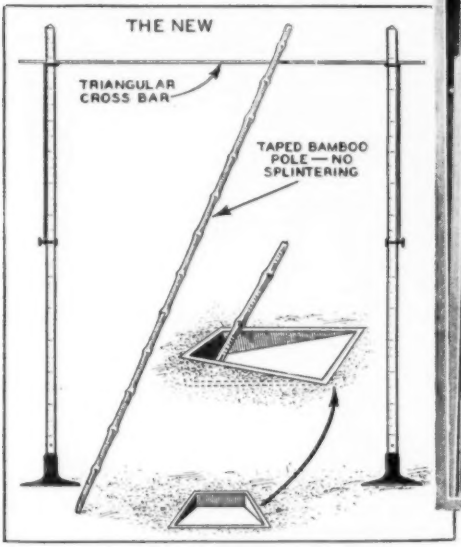
Frank Connor of the New York A. C. looks as if he might monopolize the honors in that event, although Matt McGrath, four times an American Olympic team member and now a deputy police inspector in New York, threatens to appear at Los Angeles next summer. His Olympic record hurl of 180 feet 2 inches still stands. Matt McGrath is 53. Using the modern hammer, he may set new records.

In the sprints and middle distance events I can confidently state that it will be science at the starter's pistol in the Olympic Stadium at Los Angeles. We are planning to give the runners the best starts science has been able to devise in these events. The holes will be firm, the surface around them will be solid and substantial. A start may possess that split second which may mean a new record and victory. That goes for the hurdles as well.

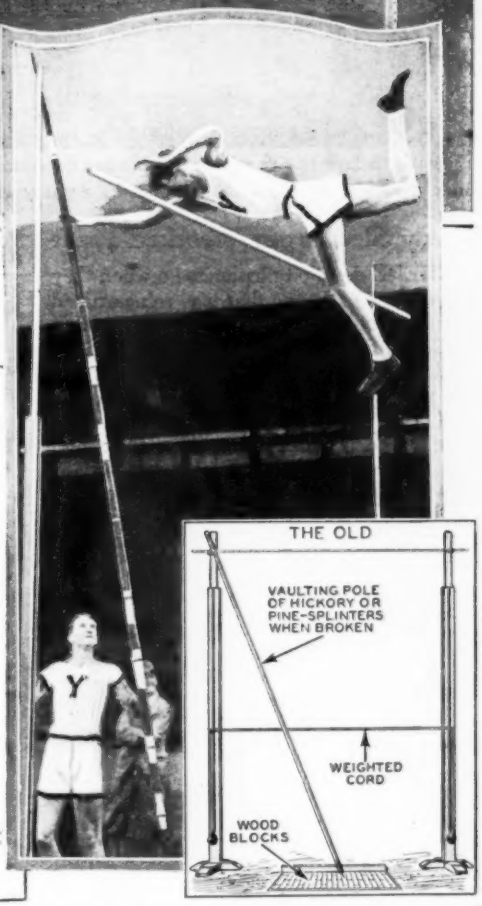
School Boys, With Modern Equipment, Now Beat Old Vaulting Records



George Spitz, 19-year-old high school athlete, who recently broke Harold Osborn's record for the indoor high jump. Spitz is one of the outstanding exponents of the use of mechanical equipment for conditioning purposes.



The modern vaulting standard, pole, and stop-board, which has added feet to the vaulting record. Compare with the old equipment on the right.



Above is shown Sabin Carr, 1924 Olympic winner, failing in an attempt at the record. Inset shows the vaulting equipment of 20 years ago.

World's Smallest Complete Radio Broadcasting Station

Here's the smallest radio station and its mystery constructor.

THE City of Brotherly Love now boasts of the world's smallest radio broadcasting station. Not much different in size and appearance from a household refrigerator, this station is accurate in all respects, operates entirely under its own power, and has a sending radius of two hundred feet with its 1/400th of a watt power plant. Its call letters are WEE, and it is owned and operated by the Tiny Broadcasting Company, operating on a frequency of 1,300 kilocycles.

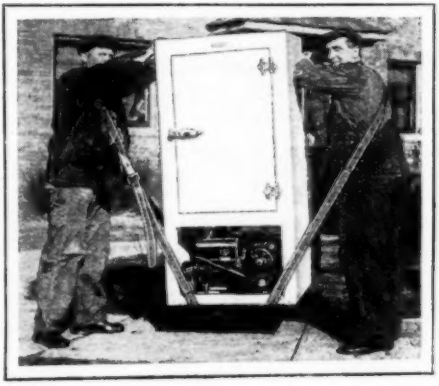
The transmitter was designed and built by the Mystery announcer of WPEN, who recently won the title of the most popular radio announcer in a nation-wide contest.

Speedy Sled From Wrecked Plane

WHERE do good airplanes go when they die? Here's one that was reincarnated in the form of an ice sled, and is now capable of making 75 miles an hour over frozen Lake St. Clair near Detroit. Robert Ellwell and John Caldwell, of St. Clair, Michigan, salvaged a wrecked and abandoned plane, installed runners and a novel rudder, and made the craft do almost as much on the ice as she did in the air. The airplane fuselage, being streamlined, made the attainment of record speeds easy. The runners for the novel airplane-sled were carefully located under the structure's center of gravity.

Robert Ellwell and John Caldwell, in their speedy ice sled which they made from a crashed airplane, making 75 miles an hour near Detroit, Mich.

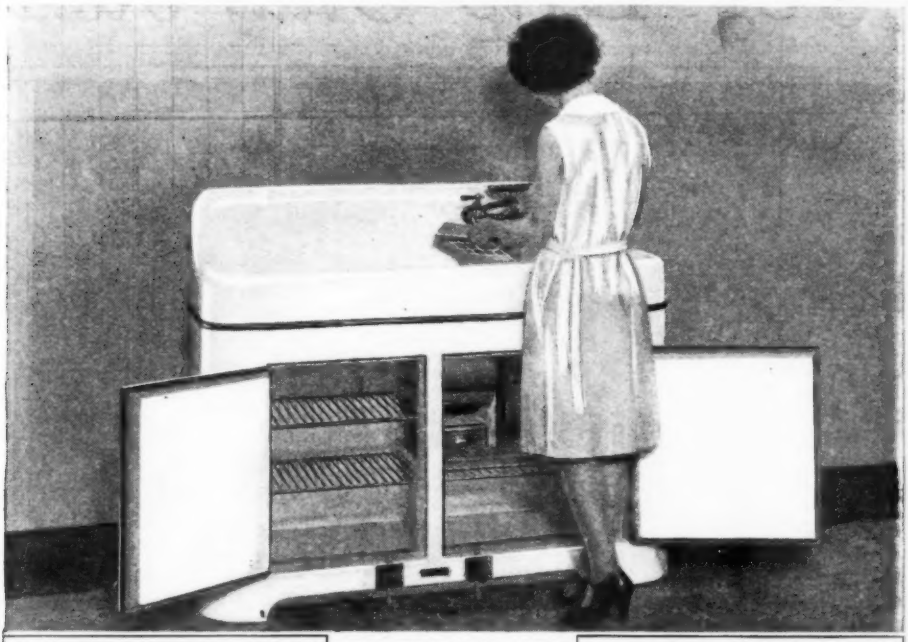
A Handy Tip for Piano Movers



Wide leather belts looped under a heavy object and over the shoulders, as shown, make lifting easy.

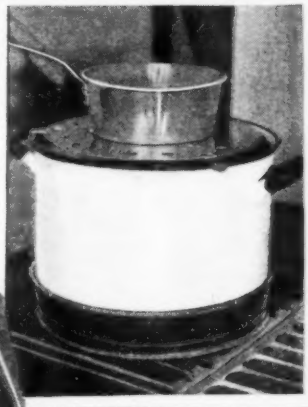
A SIMPLE easy way to carry a heavy, cumbersome object is shown in the accompanying picture. The device consists of two wide belts of leather which when buckled in a large loop, go under the object to be carried and over the workman's shoulder. The refrigerator in the picture weighs between four and five hundred pounds and the men carried it with ease. A similar swing will prove helpful to anyone moving heavy objects.

Latest Housewife Aids Perform Many Household Tasks



The "Frigisink" which serves as combined kitchen sink and electric refrigerator, saving space and steps. Pressing pedals below opens doors.

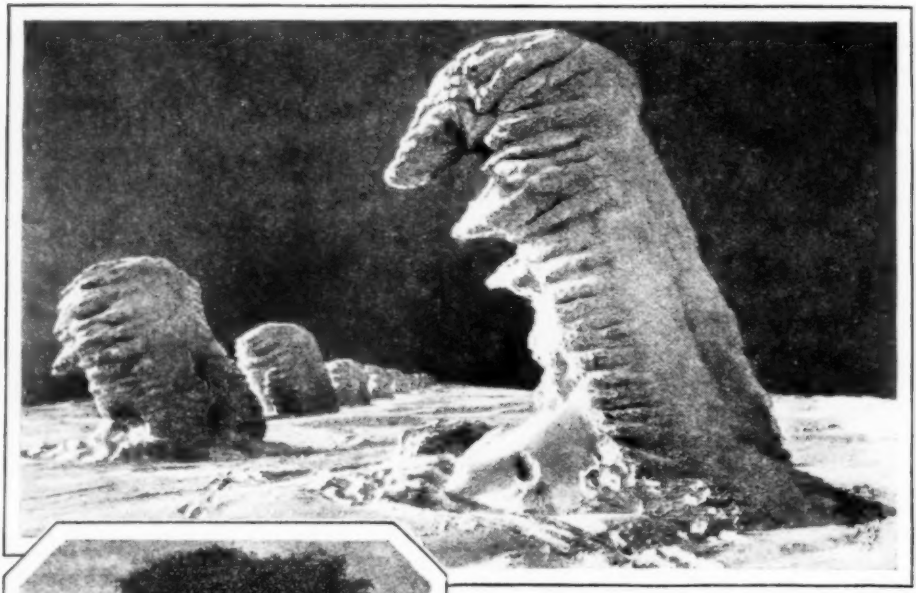
Equipped with adjustable light brackets to throw bright light on any part of the face, this bathroom cabinet with mirror on front is especially handy for shaving as well as for feminine ornamentation. A cushioned door prevents slamming.



Above—This new perforated disk fits over any stew pan, to keep food moist and hot. It also serves as plate warmer on cooking pot and as table pad for hot dishes.

Left—Container equipped with motor which washes dishes, freezes ice cream, etc.

"Fog-Drip" May Hold



These enormous deposits of rime on German boundary posts are caused by drifting fog, which turns to ice on coming in contact with solid obstacles.

The drawing above shows Ferro natives catching water deposited in fog on island "rain-tree."

by

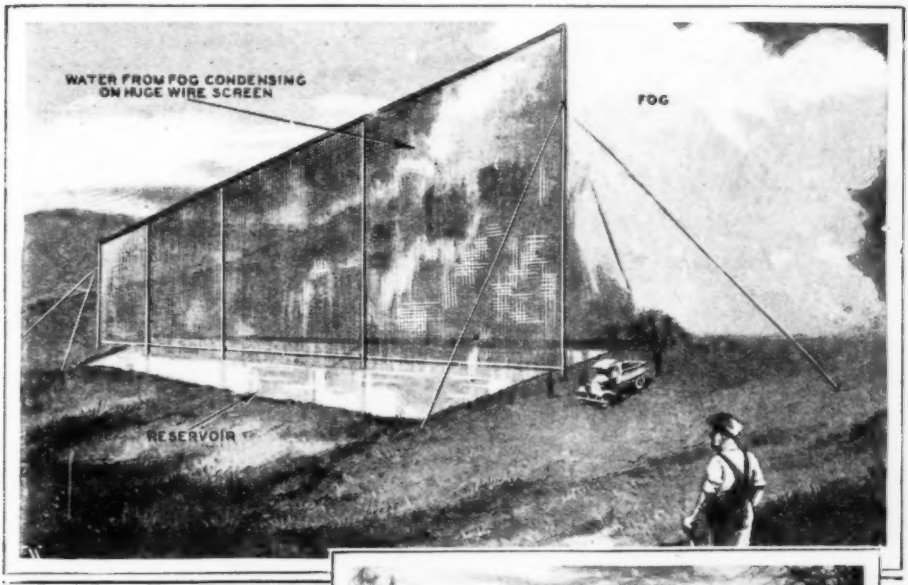
CALVIN FRAZER

Scientists, spurred on by last summer's disastrous drought, are still vainly seeking a method of controlling rainfall. In some parts of the world fog is a more important source of moisture than rain, and various methods, as described here by Mr. Frazer, have been proposed to make fog yield water during arid seasons.

THE hilly region of the Downs, in southern England, is one of the few remarkable places in the world where people may go to the hill tops to obtain water in times of drought. On the summits of these hills are found many artificial shallow ponds, most of them centuries old. When the wells and springs in the valleys below fail on account of protracted dry weather, these upland ponds still contain an abundant supply of water. According to popular belief they are fed by dew, and hence they are called "dew ponds".

The phenomenon of these English dew ponds was thoroughly investigated some

Key to Drought Relief



This drawing illustrates project planned by California inventors to condense water from fog for storage in reservoirs by means of huge wire screen. As it required a screen 250 feet high to irrigate half mile strip, the scheme proved impracticable.

Fog rolling over English downs, as shown in photo, collects on leaves of trees, then drips into pools to form "dew-ponds."

years ago by E. A. Martin, with the aid of a special grant from the Royal Society of London. He found by actual measurements that the water in the ponds does not grow cold enough during summer nights to condense moisture from the atmosphere upon its surface, after the manner of leaves and other solid objects on which dew forms. Hence the ponds are not fed by dew.

As rainfall increases with altitude, they doubtless receive a good deal more rain than the valleys adjacent, but regardless of this source of water they get an ample supply at all times from the dense fogs that drift in, especially in the early mornings, from the English Channel near by. The water in these fogs is caught by trees and shrubbery and drains into the ponds.

The bottom of these ponds consists of a layer of puddled chalk or clay which is impervious to water, so that there is no loss by seepage. In most of the ponds this watertight bottom is covered with a layer of broken stone, serving as a protection from the trampling of sheep and cattle, which come to these ponds to drink.

The process by which the dew ponds ob-

'Fog-drip' Often Furnishes Enough Water to Grow Crops in Arid Regions

A view of summer fog along California coast, seen from summit of Mount Wilson. Water deposited by these fogs keeps the vegetation green throughout rainless summer. Right—A winter fog on St. Lawrence river, caused by warm air over water.

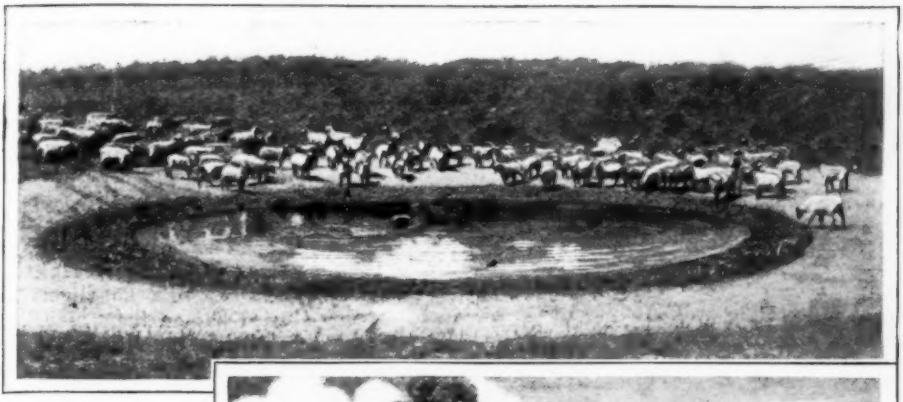
The famous "Dew Pond," at summit of Green Mountain, on Island of Ascension. This artificial pool is supplied with water by "fog-drip," which is caught from drifting clouds by the surrounding thicket of bamboo.

tain their water is known to science as "fog-drip", and is of considerable practical importance in certain other parts of the world. Thus, during the almost rainless summers of southern California the fog that rolls in daily from the Pacific affords plenty of moisture for growing a big crop of beans and other products along the coast. As much as 0.05 inch of water—equivalent to a moderate shower of rain—has been deposited from a California fog during a single night. On the coast of Peru, where the rainfall is negligible at all seasons, plants grow luxuriously during several months of the year, moistened only by the "garua", the celebrated drizzly fog of that region.

There have been many schemes for collecting fog-drip on a large scale for purposes of irrigation, but none appear to be practicable. A scheme of this sort was submitted to the Weather Bureau during the severe drought of last summer by residents of Bismarck, North Dakota, who planned to construct an experimental dew pond on one of the hills back of that city. The promoters of this project received no encouragement from Uncle Sam's meteorologists, who explained that the successful operation of the ponds in southern England depends upon local climatic conditions entirely different from those prevailing in the Dakotas. Fogs are rare in North Dakota, records for Bismarck showing only about four or five a year.

Inventors in California once proposed to set up a tall screen of wire netting to catch fog near the coast and to store the water in

'Dew Ponds' of South England Yield Water Throughout Severest Drought



A "Dew Pond" on the South Downs, in southern England, created by moisture from drifting fogs. These ponds retain water when springs of surrounding country have gone dry.

Dew ponds are supplied with water as shown above. Drifting fog settles on tree leaves, then water trickles to ground and drains into the pond.

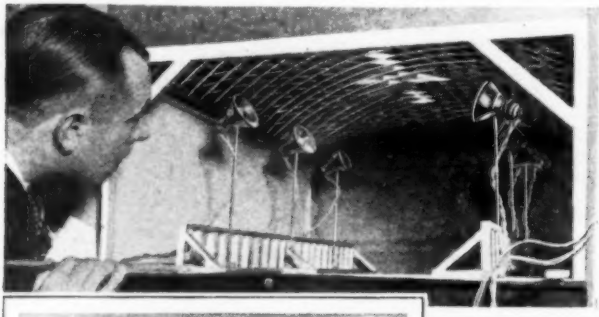
reservoirs, from which it could be piped to adjacent farmlands. This beautiful plan was knocked in the head by a cold-blooded meteorologist, Dr. W. J. Humphreys, of the Weather Bureau. Humphreys showed that a screen 250 feet high—the cost of which would doubtless be prohibitive—would provide irrigation water for a strip of land only about half a mile wide back of it. However, the scheme may still have possibilities, and inventors are continuing their investigations of the odd phenomena in various parts of the world. Their findings have proved interesting.

On the summit of Green Mountain, in the Island of Ascension, there is a small artificial pool, surrounded by a bamboo thicket, and known as the "Dew Pond." It was constructed, in imitation of the English ponds, for the purpose of catching water from the trade-wind clouds that constantly drift over this mountain, and it serves as a watering place for cattle. Water is scarce in Ascension, which has no springs and a very scanty rainfall.

Fog-drip also explains the legend of the "rain tree". This famous tree, described by many early voyagers, is said to have grown in the island of Ferro, one of the Canaries, and to have supplied water for all the needs of the islanders. Fog condensed on the tree and drained into a cistern.

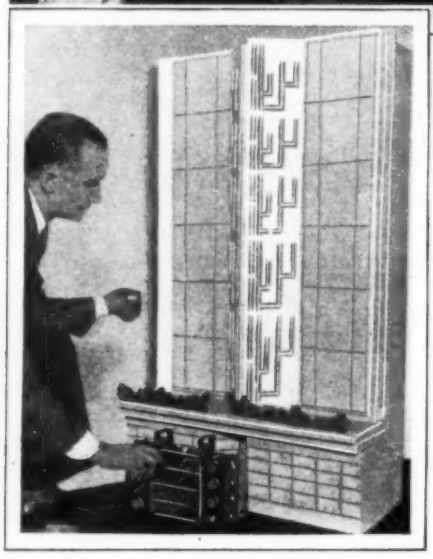
Here is the remarkable "Table Cloth," a layer of cloud, spreading over sides of Table Mountain, in South Africa. Water supplied from these clouds was found to be 16 times as great as rainfall.

World's Fair Light Effects Created on Model Buildings



C. G. Bierslam testing lighting on lamella roof of miniature building at Chicago laboratories.

TO AMAZE visitors with striking lighting effects in the interiors and on the exteriors of the buildings of the World's Fair, which is to be held in Chicago in 1933, illumination engineers are constantly conducting tests on miniature buildings in their experimental laboratories in Chicago. Tentative lighting schemes with floodlights are tried out on these models to determine the effects of the placing and coloring of the lights, so that when the large buildings are erected the engineers will be ready to set up their vari-colored lights in the most effective positions.



An illumination engineer experimenting witl lighting effects on model section of Cray building. Openings radiate lights of varying colors.

Umbrella-Vender for Showers

WHAT to do when caught in a shower without an umbrella—that is one of the world's greatest problems that has just been solved by the recent invention of an automatic umbrella vending machine which delivers an umbrella by the insertion of a coin in a slot. Devised by a noted German inventor, Herr Kreuger, the machine is placed on street corners, where it will be easily accessible in case of a sudden shower and drops an umbrella in a slot when the lever on the side is pulled down.

While the umbrella delivered by the machine is not particularly elegant, yet it sheds rain satisfactorily in an emergency and that is the chief purpose of the scheme.

Shoes Tested by Cooking, Pounding

ONE shoe store in the United States tests its shoes by cooking them for a night and a half a day in an oven at a temperature of ninety degrees, by soaking them for the same period in a solution of tartaric acid, and finally by stepping on their toes with a 1000-lb. machine. If the shoe stands all that, it is suspected of being all right, and is put on the market as a "safety shoe." The safety feature consists in a strong, box-like toe built into the shoe so that accidental squeezes under machinery or falls of heavy crowbars across a worker's toes will not cause serious injury. Many accidents are thus avoided.

Herr Kreuger with his umbrella vending machine.

Water Pressure Operates Tower Bridge

BOILERS
FOR FOOT PASSENGERS
WATER RETURNING TO TANK
INNER PIPE CARRIES WATER UNDER PRESSURE TO HYDRAULIC ENGINES
BLOCKS ON WHICH BRIDGE SECTION RESTS
ELEVATOR
HYDRAULIC ENGINES POWERED BY WATER UNDER PRESSURE
PRESSURE RESERVOIR
TOOTHED QUADRANTS WHICH LIFT BRIDGE SECTIONS

Leaves of the Tower Bridge, London, are opened by means of hydraulic engines as illustrated in the artist's drawing above.

ONE of the most amazing pieces of mechanism in the world is to be found in the Tower Bridge, which crosses the Thames River, in London. Operated by water pressure, the two halves of the bridge are raised and lowered by means of a pair of hydraulic engines, geared to toothed quadrants as illustrated in the artist's drawing above.

Water under pressure is stored in the reservoir and admitted to the engines by means of levers, this simple action being all that is necessary to open or close the bridge. The leaves are balanced, so that the entire affair rests on a pivot on a pivot shaft. In this manner a minimum of power is required when the gears of the motor engage the gears of the pinion shafts.

A hydraulic elevator is also used to raise foot passengers to the upper level when the bridge is closed for any length of time. Water under pressure is also furnished to the engines over this bridge.

"RADIO CITY" *will be*

Heavy dotted line indicates buildings now being razed to make way for the Radio City. In inset—Merlin H. Aylesworth, Pres., Nat'l Broadcasting Co.

A glittering city within a city, covering three square blocks and costing the staggering total of $250,000,000—that's the "Radio City" which will begin next month to rise in New York, the project of John D. Rockefeller, Jr. Details of this architectural marvel are set forth in this article.

WHAT is perhaps the most extensive and costly building project ever announced is the new "Radio City" which will begin to rise this spring in the heart of New York. Costing in excess of $250,000,000, the new city is in reality exactly that—a city in itself which will be a world center for radio, the theater, and business.

John D. Rockefeller, Jr., will be landlord of this huge group of buildings, and the National Broadcasting Company, several theater units, and probably the Metropolitan Opera will be among his most prominent tenants. The fact that the National Broadcasting Company will dominate the picture, with its 68-story office building rising in the center of the group, accounts for the popular name for the project.

Merlin H. Aylesworth, president of the N. B. C., has provided for the popular acceptance of television in considering his building plans.

"We are bending every effort to peer five or ten years ahead," he said. "We are laying our plans with a view to practical television, for we expect television to emerge definitely from the laboratory at about the time the Radio City is completed." This will be in 1934, according to present plans.

There will be nine buildings in all in the

Marvel of Architecture

View of the Radio City as it will appear when completed in 1934. The dominating central tower will be the home of the National Broadcasting Co. It will house 30 broadcasting studios, equipped to handle television as it is perfected. Office buildings, shops, theaters, and other structures will occupy space as indicated on the floor plan at right.

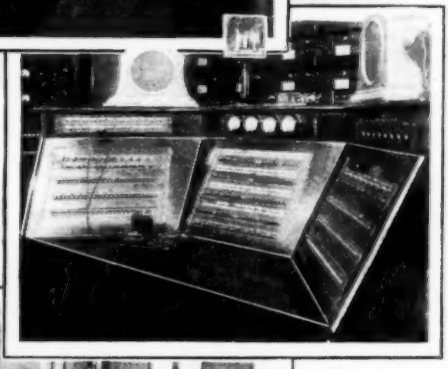
Maze of Electrical Apparatus Keeps Check on Radio Broadcast Quality

Above — A studio control booth where an operator controls the volume of sound before it goes to the main control room. In front of him is a plate glass window through which he observes the broadcasting artists.

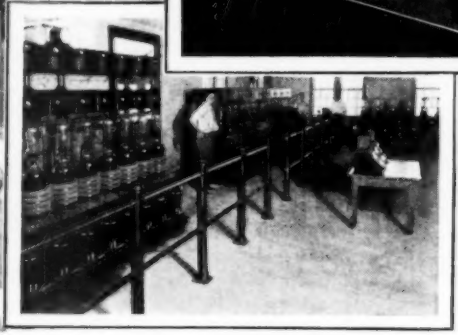
At the "mike" —first step in broadcasting.

At right—Master control board in the main control room of the National Broadcasting Co's Times Square studios. Scores of broadcast programs pass through this apparatus daily, including Amos 'n' Andy and other favorites whom the radio fan listens in on daily.

These pictures show the steps your favorite radio broadcast goes through before it reaches your home set.



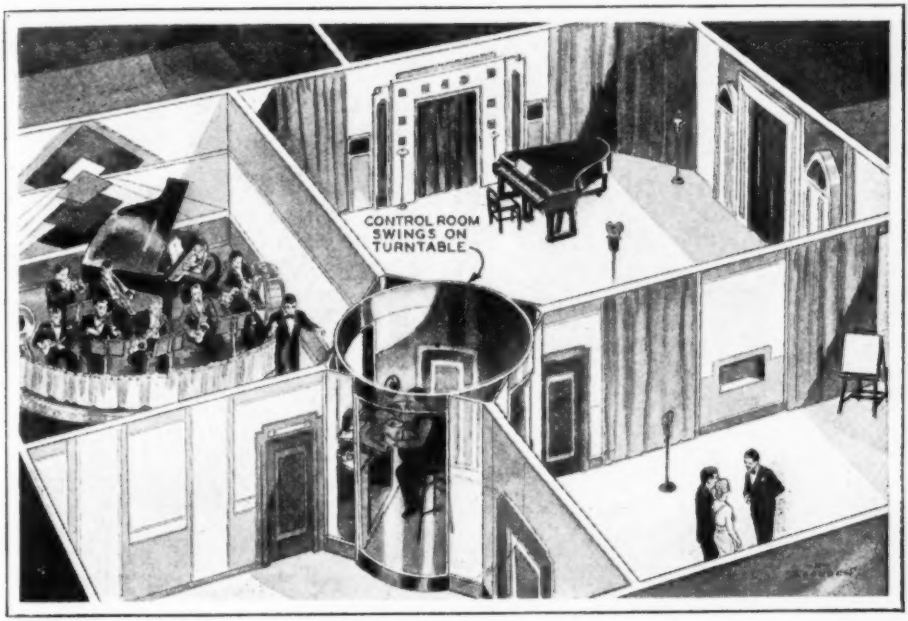
The final step — receiving the radio program on the home set.



Above — The master control board in the main control room, where the program's volume is checked before going out to the various transmitters.

And above is shown the transmitting station apparatus, where the final task of getting the broadcast on the air is completed. A view of the elaborate electrical apparatus used by broadcasting companies helps one to realize that radio entertainment is a big business indeed.

Control Room on Turntable Simplifies Problem of Making Swift Changes



An ingenious feature of the new broadcasting studios will be the building of a control room at the intersection of four chambers, so that by revolving the apparatus an instant change can be effected.

Radio City, occupying a space of three square blocks valued at $100,000,000, on which Mr. Rockefeller holds a long term lease at $3,000,000 a year rental. The broadcasting tower will not be as tall as the Empire State building, which now holds the height record, but it will contain 150,000 more feet of floor space—2,000,000 in all. On one side it will present an unbroken wall 675 feet high. Only thirty studios will be built at first, but the center of the building is so designed as to permit the construction of sixteen more.

For a distance of sixteen stories above the street, there will be no windows.

In designing the studios, architects have made special provisions to accommodate the thousands of visitors who will flock to the entertainment center. Separate elevators will take them to the gallery floors, where they will take theater seats and look down into the studios and control rooms through thousands of square feet of soundproof plate glass partitions.

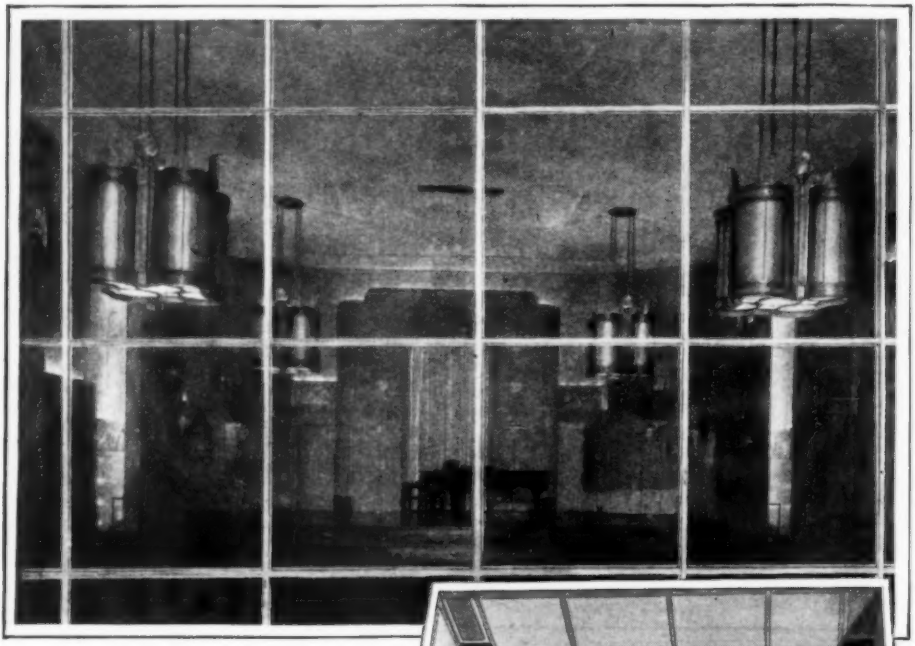
Several of the broadcasting chambers will be at least 115 feet long, 65 feet wide and three stories high. These size proportions are expected to provide the ultimate in acoustical effects. An increased use of the directional type of microphone, which is set up some distance from the performer, is anticipated.

Some of the studios will incorporate a novel adaptation of the revolving stage idea, except that it will be the control room containing the recording apparatus which will rotate, rather than the stage. This control room, circular in shape, will be located at the intersection of four studios so that the operators can switch from one set to another with unbroken continuity, giving an almost instantaneous change of scene.

Elaborately insulated walls and floors will make the broadcasting rooms entirely soundproof. This is particularly important where the programs being broadcast are laid in out-of-door settings, where the slightest room noise would destroy the effect.

It is possible that the central tower of the Radio City will be surmounted by the masts of a television transmitter to release images for audiences in the metropolitan area. Whether or not it will be practical to broadcast television programs from the heart of the city, or whether it will be necessary to locate the transmitters in the suburbs, as is

Glass Walls for Broadcast Chambers Permit Spectators to Look on



A typical broadcasting chamber, with special lamps for indirect lighting of the performers. Glass curtain in front of room permits spectators to view the broadcast.

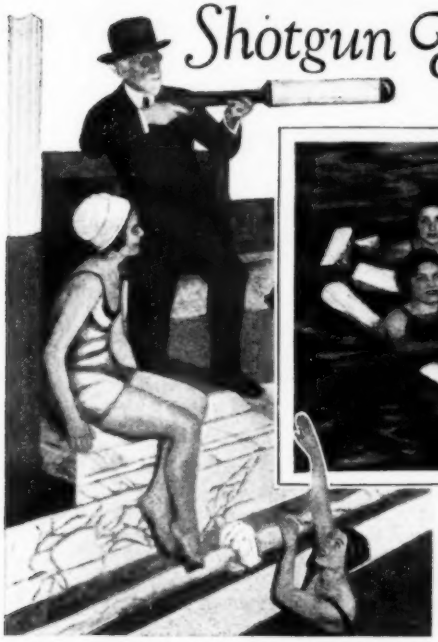
Broadcasting chambers three stories high, entirely enclosed with plate glass and surrounded with galleries for spectators, as shown here, will be provided in the new Radio City.

the case with most of the broadcast transmitters, will not be definitely known until tests now under way are completed. Adjacent skyscrapers, it is feared, will have a bad effect on television images, absorbing energy from the broadcast waves, leaving the images grotesquely distorted.

Although the immense sum of $250,000,000 has been announced as the probable cost of the Radio City, it is likely that even this tremendous figure will be found inadequate. Unofficially it has been reported that construction costs will run closer to $400,000,000 by the time the city is completed. It is pointed out that the plans announced will likely be changed in some details to meet changing circumstances as building of the city progresses.

Whether or not television is going to duplicate the success of audibly broadcast radio programs is something which nobody knows definitely, but the fact that the keenest brains in the radio world are providing for television broadcasts in their new wonder building is significant of the preparations being made by the industry to welcome television as an accomplished fact.

Shotgun Fires Life Preserver



James Reno, inventor, firing his float from gun.

Made also of Balsa wood, Reno's life raft, shown here, weighs 65 lbs. and supports 50 people.

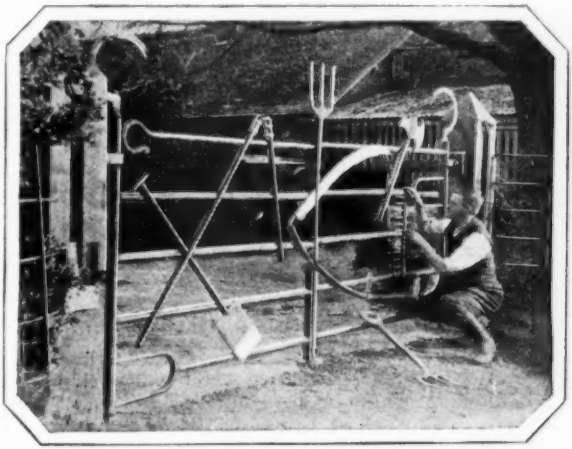
A LIFE saving float made of light weight balsa wood and fired to the drowning person from a shotgun, as a rifle grenade is shot from an army rifle, is the latest wrinkle in life saving devices. Designed by James Reno, a wealthy New York inventor, the contrivance comes in two forms, one being the aforementioned float which can be thrown with a blank cartridge discharge over the water at a distance of 150 feet, the other being a life raft made of balsa wood cylinders, which can be fired from the ship's life line gun.

New Food for Flying Emergencies

CONCENTRATED food having balanced rations and capable of supporting aviators in an emergency for 24 hours is now being adopted by flying companies to place aboard their planes.

Unique Garden Gate Built From Sickle, Fork, Spade and Other Tools

A NOVEL and ingenious gate which is quite appropriate for a farmyard has been constructed by W. N. Mead, of New Mill, England. The farm implements used in the gate, shown in the photo at the right, include a sickle, a threshing flail, a scythe, a shepherd's crook, a pitch fork and a spade.



This unique gate, entrance to farm in Mead Hill, England, is made from sickle, scythe, spade, flail and other farm tools.

Removed Heart Lives

KEEPING a human heart alive and beating for thirty-six days after removal from the body of an embryo child is the amazing feat recently performed by German scientists at Berlin University. During this period the formation of new blood continued.

Rubber "Wing Shoes" Eliminate Ice Hazard on Airplanes

The first plane to be completely equipped with the Goodrich ice-breaking equipment. The dark strips on wings, wires and struts, shown in the photo above, are the "shoes" which cover the tubing.

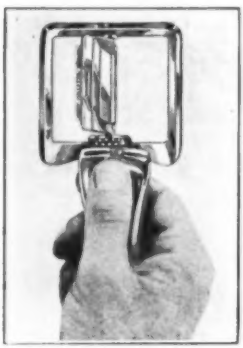
EXTENSIVE testing of the new Goodrich "wing shoes" for airplanes, under actual flight conditions, has been carried out with a mail plane operating from the Cleveland airport. The shoes are recently-developed rubber devices for removing accumulated ice from the wings, wires and struts of an airplane that is flying through regions hitherto considered dangerous enough to be avoided. Airmen operating the plane deliberately seek ice-forming weather.

The coverings, made of rubber and fabric, are moved by compressed air delivered, in the experimental plane, by a tank. A pump-and-tank system will be employed in commercial installations. When a coating of ice forms on the wings, always at the leading edges, the pilot admits air to the tubes that lie flattened beneath the rubber shoe, the covering expands, and the ice, cracked by the movement, is blown off.

Edge-Grinding Razor Sharpener

ILLUSTRATED below is a new device for sharpening razor blades which has recently made its appearance on the market.

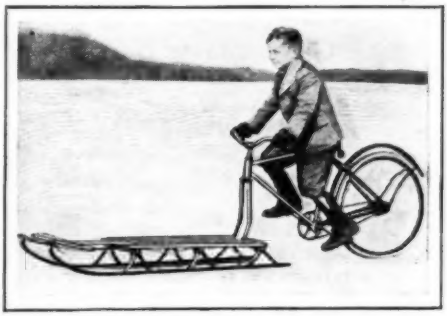
In principle, this sharpener differs quite radically from other devices heretofore introduced for the purpose of improving the cutting-edge of safety razor blades. Instead of merely smoothing down the rough edges of the blade, as a leather stropper does, the Keenex grinds a new bevel on the blade by means of a powerful edge-cutting abrasive which is incorporated in the leather.



The blade holder ready for insertion of the impregnated leather strop.

This device is composed of two units; a leather strop which is impregnated with an abrasive, and a blade-holder which strokes the blade against the impregnated strop at a certain angle, with the result that the curled metal edges are ground off and a new bevel is put on the blade at the same time.

A New Method of Travel on Ice



Billy Bataille, of Dover, N. J., is shown pedalling over frozen Lake Hopatcong on his bicycle sled.

BY MERELY taking off the front wheel of his bicycle and sticking the forks of the frame into the cracks between the boards of his sled, 12-year-old Billy Bataille, of Dover, New Jersey, has perfected a new method of traveling over ice and snow, and can even carry a passenger.

New Many-Purpose Table Folds Into Handy Carrying Case

When folded up, the new Hy-Lo table may be placed in a carrying case, as shown here, and taken on picnics.

Invalids will find the adjustable Hy-Lo table convenient for dining in bed.

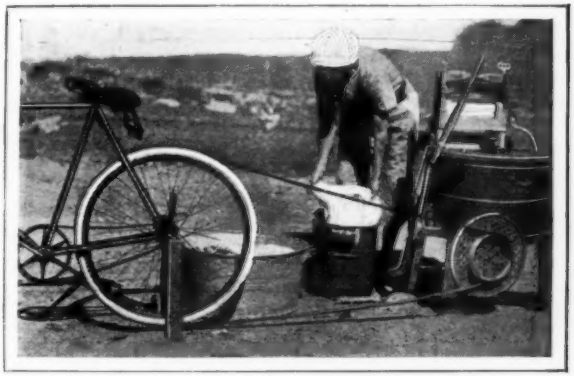
THE needs of bridge players, writers, picnickers and bedridden invalids are filled by the new Hy-Lo portable folding table now on the market. With sturdiness as its most noteworthy quality, the table folds up into a compact unit, which may be conveniently placed away in a closet or carried in a case, as demonstrated in the accompanying photo. The legs are adjustable to any height, thus permitting its use as a bed table, low writing table, or even a card table, and the top is divided into quarters for compact folding.

The top of the table is divided into four sections for folding, as shown here, while the sturdy legs are adjustable to any desired height.

Housewife Washes Clothes by Pedaling Bike Belted to Wash Machine

FEMININE ingenuity in the field of mechanics is demonstrated in the case of a Baltimore housewife who devised what might be called a novel bicycle-motor for turning her washing machine. She simply removed the rear tire from the bike, mounted the rear axle on a wooden upright, and belted the wheel to the pulley of her washer. Then she takes what amounts to a stationary ride on the bike for a half hour, and lo! the family clothes are all washed.

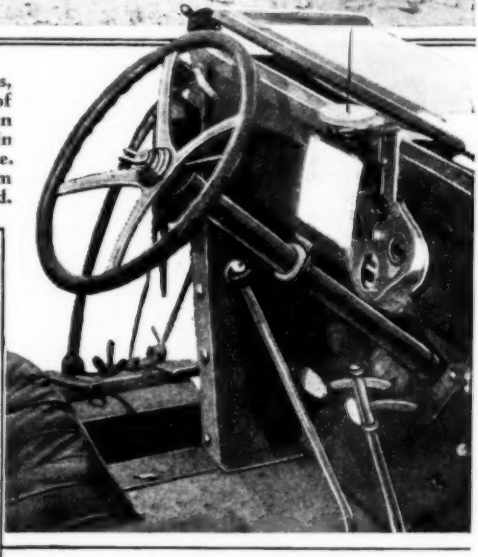
This method she found far less tiresome than the usual one of operating the machine by hand. But most of all, as a scheme for reducing it can't be beat.



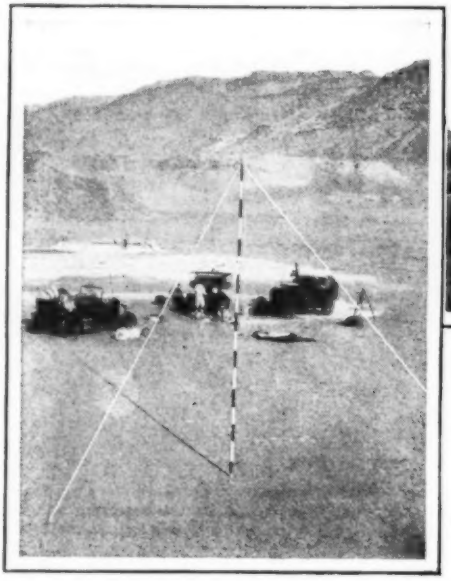
This novel bicycle-motor consists of a bike with a rear wheel supported by uprights and belted to the washing machine. In this manner clothes are washed by pedaling the bike as if on a ride. After use, the bicycle is easily unhooked from its improvised stand and used for the usual riding purposes.

"FLIVVER" Expedition

Using three Ford cars with special truck bodies, an expedition headed by Maj. Ralph Bagnold of the British Army recently crossed the Libyan desert, stretching westward from the Nile River in Egypt. Members of the party are shown above. Note the tubes in the radiator tops, in which steam from boiling radiators is condensed and saved.



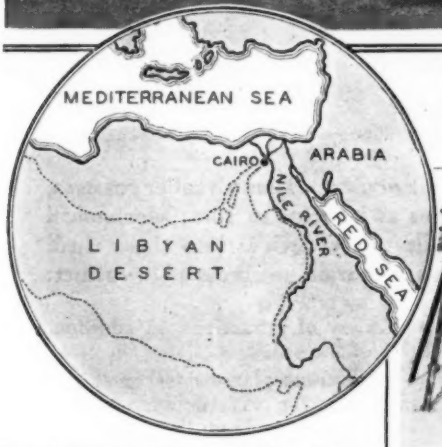
Above—Maj. Bagnold's sun compass is the needle-like device fastened to the dashboard in front of the steering wheel. The shadow of the needle falls on a graduated circle which indicates the direction in which the car is pointing.



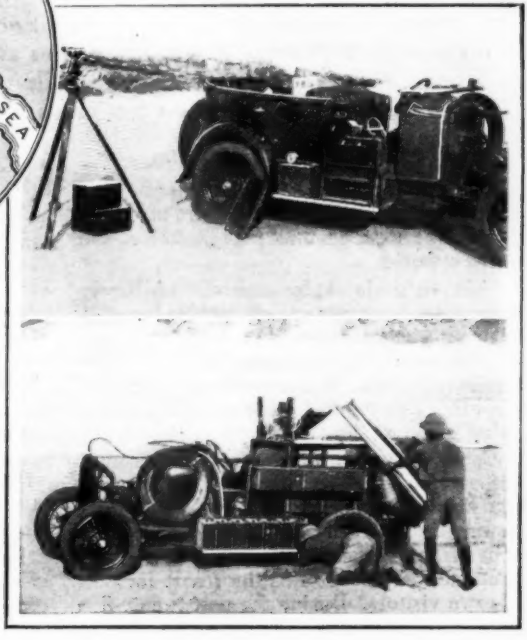
At left—At camp in the desert, 200 miles from water. The wireless mast is seen erected to receive time signals from Europe, necessary to find longitude from star observations. There aren't any signposts in the desert!

Crosses Dreaded Desert

The desert well of Bir Sheb, on the old Arabian slave route. This remarkable photo presents an impressive picture of the utter desolation and lifelessness of the great desert in the background.

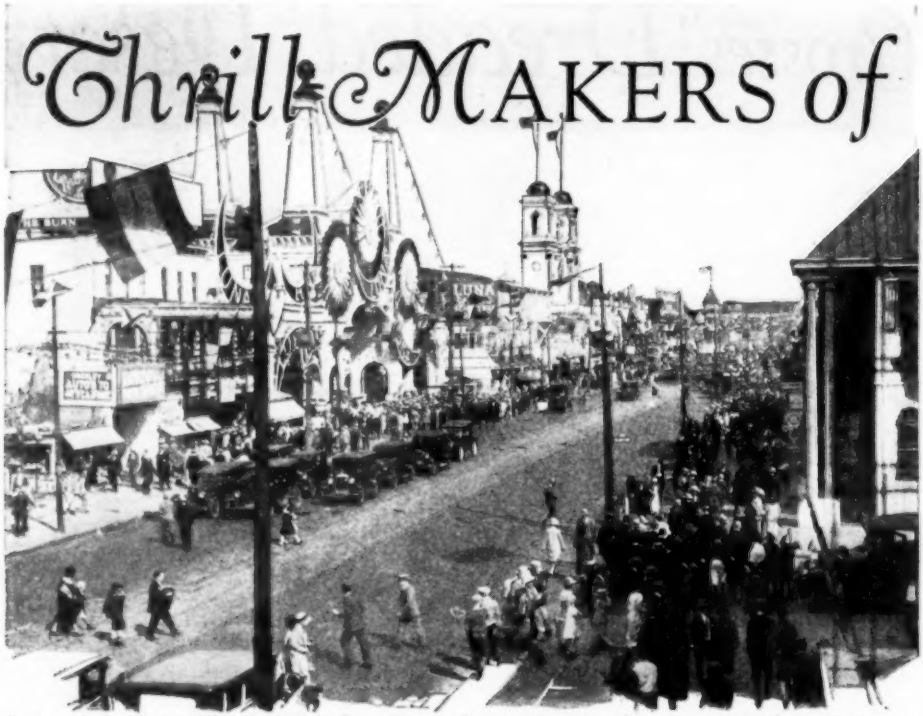


The above map shows the position of the Libyan desert, stretching westward from the Nile. Maj. Bagnold's object was to discover the legendary oasis of Zerzura, reported to exist in the unknown fastnesses of the barren lands, but he failed to locate it.



At right—Top photo shows the odolite and wireless receiving set used in determining position in the desert. The lower picture at right shows the method of extricating a car from deep sand. Short lengths of metal troughs provide channels for the rear wheels to run in. Light rope ladders are then stretched ahead, and the car climbs out under its own power.

Thrill-MAKERS of



A view down Coney Island's "Main Street" on a busy midsummer day when carnival crowds are out.

When you take a hair-raising ride on one of Coney Island's roller coasters, the stunt isn't really half so dangerous as it seems to you. Mechanical geniuses behind the scenes have built safety devices into these thrill machines so that they're less dangerous than walking across a busy street.

EACH year from May to September, approximately 60,000,000 persons visit and abandon some of their dollars at Coney Island, the most famous playground of the western world.

This peninsula of pleasure, which is barely three miles long, attracts multitudes from all parts of North America. For the greater part of five months it pulsates, thrills, and explodes with fun; then it withdraws into its shell to await the following summer's awakening and invasion.

Coney Island protrudes from the southeastern tip of Greater New York, jutting into the Bay off Brooklyn. For nearly a half century it has been a spa for those seeking relief from the heat and hustle-bustle of the congested city as well as the resort for out-of-town visitors. During the past twenty-five years its fame has been far-flung due to its variety of attractions, in addition to its lures of the sea.

The average pleasure-seeker at Coney Island, shrieking with delight as he swoops down a steep grade on the roller coaster, to be caught up the next moment and flung toward the sky as the thrill-car starts to climb at break-neck speed, never for a moment dreams of the science and mechanical skill which have been combined to give him his thrill in absolute safety. Yet both skill and science are there in the background, back of the Ferris wheel and the Whip and the merry-go-round and the thousand and one other thrill-makers which lure the dollars from Coney Island's carnival crowds.

For example, let us pry into the workings of the Thunderbolt, one of the three roller coasters. George Moran, its manager, says that three years ago he installed the Thun-

Coney Island

by ALFRED ALBELLI

The merry-go-round doesn't do so well at Coney Island as it used to. New mechanical thrill-makers which afford more excitement are crowding it out.

derbolt at a cost of $250,000. Since that time he has carried 750,000 passengers, which, at fifteen cents a head, means it has brought $112,500. "One more season," says Mr. Moran, "and the Thunderbolt will be mine."

"The Thunderbolt," explained Mr. Moran, "is operated on a scale of 25 per cent electricity to 75 per cent of gravity. As you know, gravity costs us nothing.

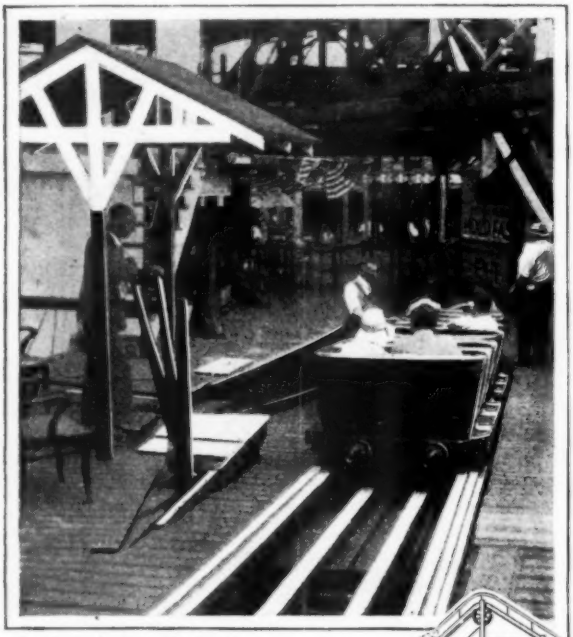
"In conveying the cars up the inclines we use a link-belt chain, similar to those used in mines. On its first rise, the three cars which form a roller coaster train, go up to an elevation of 75 feet, then drop suddenly at a 57 degree and then pitch up at a 62 degree angle. About this time you feel that the car is going to turn over or be ripped from its moorings, but the engineering design of the roller coaster takes account of natural laws and provides an adequate margin of safety.

"At another point it drops at a 68 degree angle and shoots up an incline of 66 degrees. After that first drop, the roller coaster is carried around the entire route of three-quarters of a mile wholly by gravity. There is no motor-power application. It covers the distance in one minute and seven seconds.

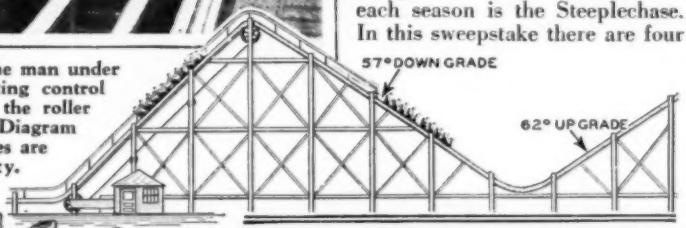
"In the plant we use a 100 horse power motor, which is 50 horsepower more than is required. The plant is located in a shed situated twenty-five feet from the ground in a space within the labyrinth of tracks which go to make up the roller coaster proper.

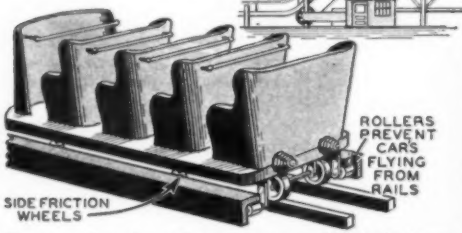
"Once the train is dispatched on its first drop, there are no brakes which can regulate it, should anything happen along the course.

Roller Coaster Cars Can't Fly Off Tracks—Hidden Wheels Hold Them



The long levers which the man under the shelter is manipulating control the brakes which bring the roller coaster train to a stop. Diagram at right shows how grades are calculated for safety.





Ever wonder why roller coaster cars didn't fly from the rails? The drawing shows the safety wheels.

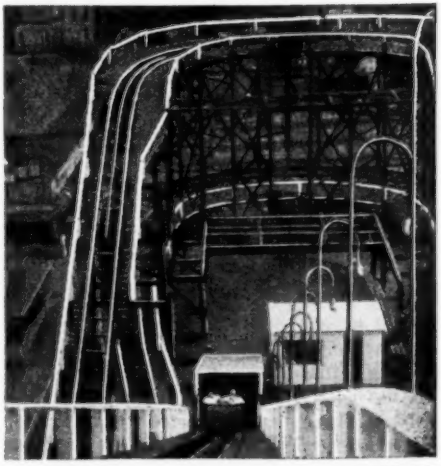
However, even if so vital a part as its axle were broken, the train is so constructed that it would come home of its own accord.

"Each train has under-friction rollers, consisting of four rollers which hold it down when it has a tendency to rise off the tracks. Then there are four side-friction wheels which take care of the side-friction. And there are four more riding wheels which ride along the upper surface of the track.

"The cars are finally stopped, after their uncontrolled career through space, by a 200-foot friction brake with three levers. When the brake is thrown on, the friction shoes on each car press down on the long friction-brake. This contact of wrought-iron against steel brings the train to a halt.

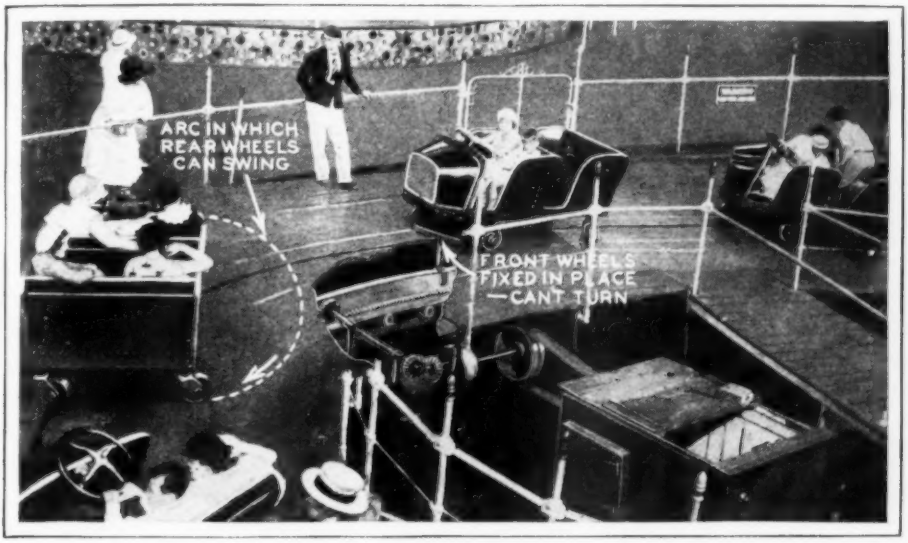
"The hazards of riding a roller coaster are negligible. Most of the accidents happen when the rider disobeys rules, and are not due to the construction or operation of the roller coaster. Two mechanics walk the course twice a day, inspecting every link and bolt. City inspectors make a thorough examination once a week, and then the insurance company sends around its men to inspect. Everywhere there are safety contraptions. We make it look far more dangerous than it is. Otherwise you wouldn't ride it."

Another mechanical ride which brings the owners a rich harvest each season is the Steeplechase. In this sweepstake there are four



Gravity does most of the work on the roller coaster. Here a car is being hauled up the initial grade, after which it continues under gravity's control.

These Autos Can't Crash Together, Though Occupants Think They Can



When these cars are in action they swing crazily and seem in imminent danger of crashing into each other. But the rear wheels are the only ones which can swing freely, the front axle holding the car to the track so that collisions are impossible. Cutaway section shows mechanism which moves the cars.

wooden horses which race around a course which is supposed to represent hill and dale and the riders imagine themselves as embittered jockeys. Two persons ride each saddle.

At the starting point the horses are released down a mild decline and again they are driven by gravity until they reach a gentle slope of a track. Here they are pulled up for about 25 yards by a system of chains and gears, not unlike the method used in the roller coaster, and then when they reach the top of this first hill, they glide off and downhill on their own again.

The horses are placed on two trolley wheels and it is these wheels which whirl them around the whole course after their first descent. Gravity and the wheels do the rest on the ½-mile ride.

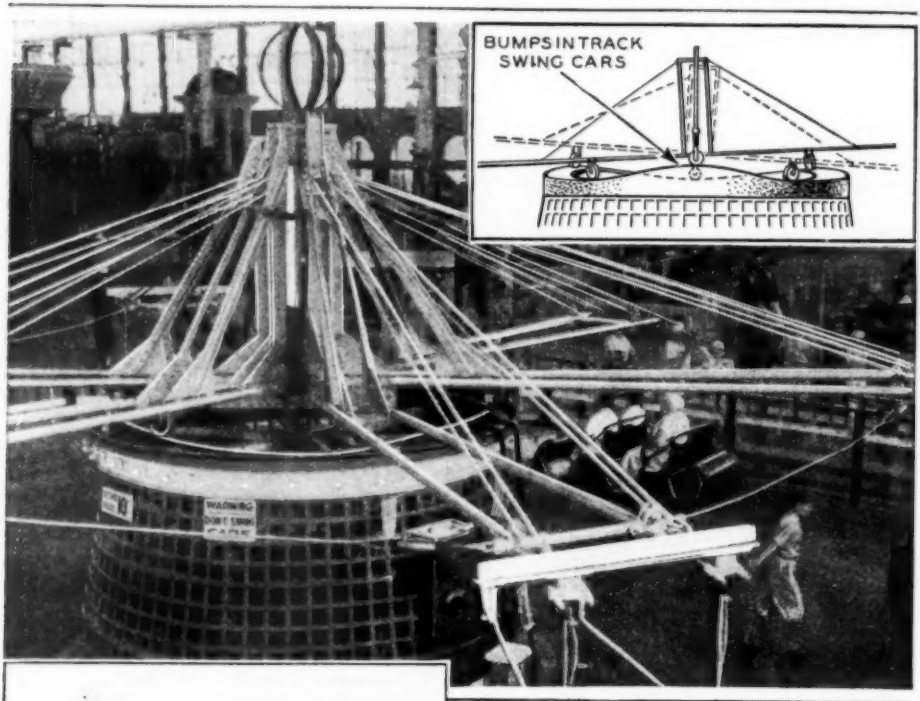
There are 65 races run off an hour on this mechanical track. Over 5,000 ride these horses daily. Not more than $5.00 worth of electricity is consumed each day.

On the other hand, Coney Island has become so vast that there is a large electrical plant there and one of the biggest gas works in the country. It is estimated that the pleasure colony's electric bill each day is $10,000 and that its gas bill is more than $5,000. Next to the labor item, these are the two outstanding costs of upkeep which disturb the proprietor at Coney Island, who is perhaps the only individual in the universe who can mix pleasure and business and make it pay.

Several Sundays during the past summer have seen a population of 1,000,000 persons on the beaches which flank the island. Behind the boardwalk which skirts along the ocean front there are, strange as it may seem, a dozen swimming pools. Here all kinds of diving and raft apparatus are installed to win the swimmer from the ocean's surf.

In the restaurants one finds none of the elements of a mechanical nature to intrigue the attention. Food is doled out according to the oldest of rituals to the hungry. One food stand alone, however, boasted of selling 100,000 hot dogs during one of the 1,000,000 population Sundays.

But in the matter of games, the inventive mind is more in evidence. They are no longer games of chance, but games of averages. They are for the most part on the level, the owner of a particular stand finding his profit in the law of averages. It is not always that some one wins anything, and often it may be some one he has planted out front to play a number which is consistently lucky. Occasionally, one still hears of the



Cars on the ends of long cross bars are swung up and down and outward on this device until the passengers' hearts are in their mouths. The diagram illustrates how a track with elevated sections imparts the thrilling movement without danger.

Chuting the chutes—always a favorite of the amusement park fan. It's a real thrill sliding down the ways and splashing into a pool at the bottom, but there's no danger. It's the amount of spray flung up when the boat strikes water that gives the illusion of great speed and imminent peril. If you fell overboard you wouldn't be much the worse.

wheel with numbers which revolves until the owner puts his foot on a hidden brake to stop it at his desired number.

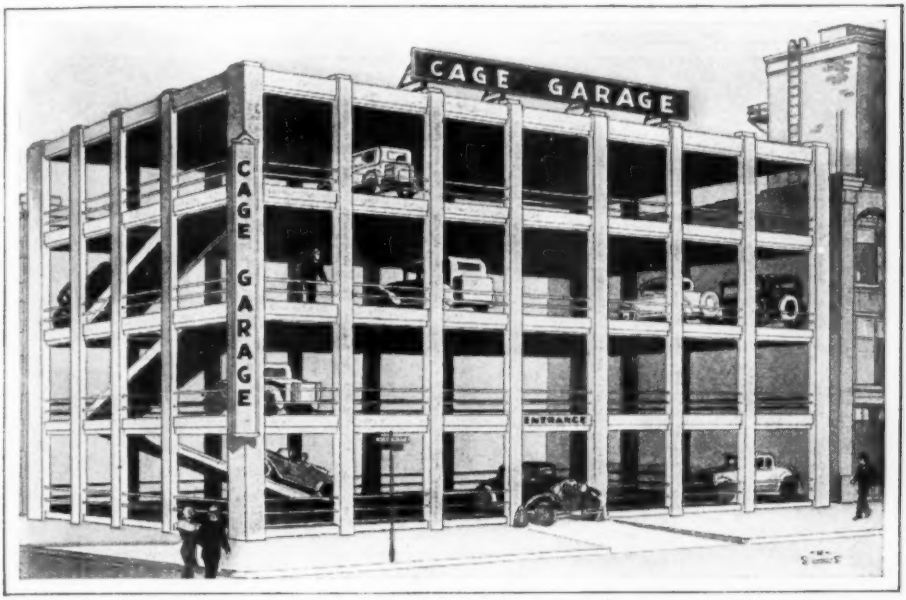
The day of the merry-go-round and the flying horses at Coney Island seems to have gone. There is a mournful, lugubrious atmosphere about these carousels which were once the center of the fun-making. Those indulging in these riding revels seem to take to other apparatus. At one merry-go-round the records showed that exactly 500 persons had been on the horses that week.

The Ferris wheel, one of the most ancient of rides, still gets a big play at Coney Island. This weird wheel which revolves slowly, giving the nerve-wracked occupant of a carriage-body contraption a view of the distant as well as proximate panorama, reaches up into the air 125 feet.

Around one rim of the wheel there are

(Continued on page 192)

Garage Without WALLS for Car Parking



This new garage can be built at low cost on vacant lots, solving parking problems in crowded areas.

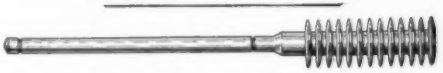
A TYPE of garage built on entirely new lines has been designed and patented by Samuel Eliot, a real estate operator and building manager of Boston, Mass. Known as a "cage garage," it is an open-air parking space stepped up three or four stories, with no side-walls or windows, no heat, no elevators or electric lighting. It has a low stud of eight feet, staggered floors and a twenty per cent pitch double ramp that takes up the space of only two cars. The construction is of reinforced concrete, and the inventor says that such buildings can be constructed at the low cost of ten cents a cubic foot, and can accommodate as many as 800 cars easily.

It is estimated that such garages will be able to earn five times the amount earned by the more expensive types of public garages. The cars are run up the ramps under their own power and parked as on an ordinary open lot, with room to run them out when wanted. The buildings are strictly fireproof and are easier of access to fire apparatus than the expensive enclosed public garages.

A company is being formed to build these garages throughout the country. The plan is to lease ground space near the business districts of large cities.

New Toothbrush Has Rubber Disks

SANITARY rubber disks are now used in a new toothbrush which is very easy to keep clean. The disks are thin enough to enter easily between the teeth.



Rubber disks of brush fit easily between the teeth.

Spokeless Air Wheels

The air wheel test car, a high-power truck loaded with pig iron, made a 20,000 mile run under all kinds of road conditions on 10 pounds pressure.

The first Musselman type truck tire was built by hand by A. J. Musselman at Chicago in 1928.

LATEST rumors in Detroit and Akron indicate that there will be a radical change in tire styles before many more auto shows come and go, and that with this change will also come entirely new chassis and body designs.

The newest thing in auto tires has been under laboratory and actual operating tests for many months. Up to the present time every effort has been made to keep these tests as secret as possible. However, the results of the road tests have been so astounding that some brief news of this latest development in the auto industry was bound to leak out. The date on which the new tire will be brought before the automobile trade and the public has not yet been announced, but it is expected that it will be introduced just as soon as factory facilities will allow.

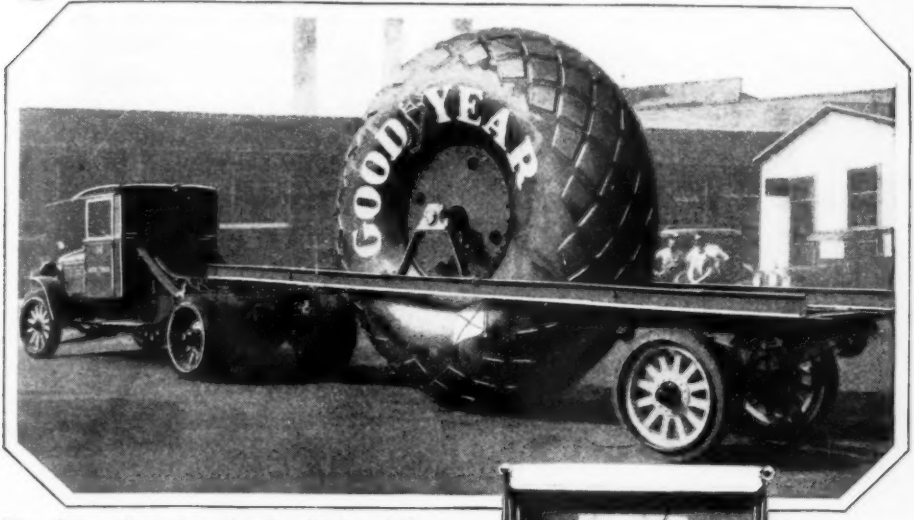
To the layman, the obvious difference in this new tire (known in tire circles as the Musselman type) and those that he now uses on his car, is that this new tire needs no wheel on which to mount it. The tire uses the hub for a rim and is a complete wheel in itself; consequently, all the space from the hub to the outside diameter of the tire is air space. This tremendous air capacity allows extremely low pressures.

A comparison with present air pressures is shown in the following table:

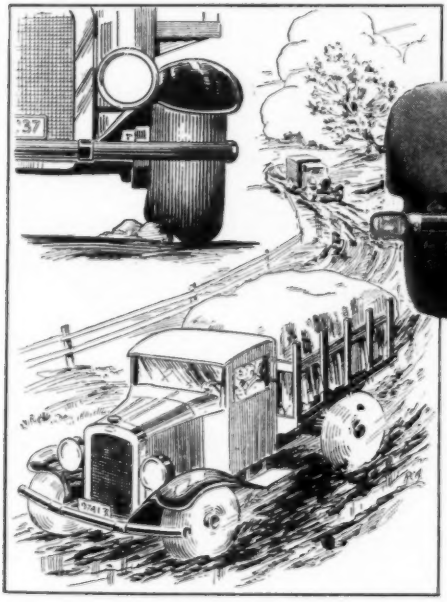
Present Pressures	Pressures with Musselman type tires
35 lbs.	7 lbs.
40 lbs.	10 lbs.
45 lbs. or over	15 lbs.

This low air pressure, of course, gives additional riding comfort, taking the bumps out of the road to a still greater extent than do the present day balloon tires. It also gives

Coming Auto STYLE



Tire shown above is twelve feet high and four feet wide, built for advertising purposes, but can be put to practical use. It will support 75,000 pounds at an air pressure of only two pounds.



These drawings show the advantages low pressure tires will have on bumpy or muddy roads.

The second test truck, which was built especially for use with low pressure tires, is shown here.

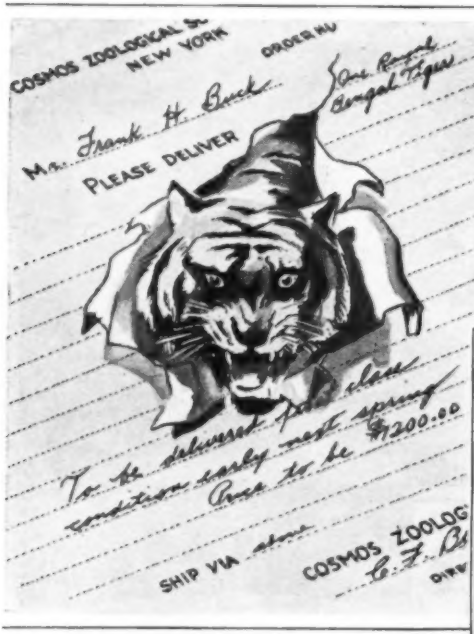
a greatly increased contact area so that the danger of skidding on wet and slippery pavements is practically eliminated.

The advantages of the Musselman type tire for airplane use are all well known. Its low pressure makes it a perfect cushion or shock absorber for landing. But it was not until experiments were made with motor vehicles that the manufacturers realized that this new type of tire would in all probability revolutionize the tire and auto industry.

From JUNGLE to ZOO on

as told by FRANK BUCK
Famous Animal Collector

One of the most thrilling jobs in the world is that of Frank Buck, who captures wild animals for zoos all over the globe. He tells of some of his perilous experiences in this article. With Edward Anthony, he is author of "Bring 'em Back Alive," a fascinating book of his animal collecting adventures.



Tigers, elephants, lions—they're all the same to Frank Buck, who delivers any animal wanted.

FOR eighteen exciting years I have been gathering live animals, reptiles and birds for the zoos, the circuses and dealers. I have brought back to America thousands of specimens. I have had more than my share of thrills, including narrow escapes from the fangs of venomous serpents and the claws of man-eating tigers.

One day not so long ago I was in the office of Dr. William T. Hornaday, then Director of the New York Zoological Park. After discussing some lesser assignments, Dr. Hornaday reopened a subject that had been close to his heart for some time. "Isn't there any way we can secure an Indian rhinoceros?" he asked. "You know I've always wanted one."

The Indian rhino, as far as India itself is concerned, is virtually a non-existent animal. In the little state of Nepal, the Indian rhino has always been regarded as royal game, no one except the Maharajah and those friends and associates to whom he gave special permission being allowed to hunt it.

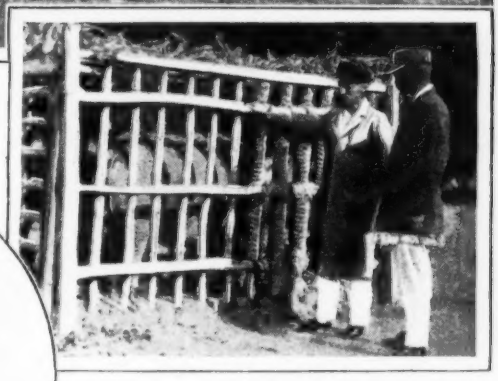
Frank Buck in tropic working dress. He once knocked out an orang-outang with his bare fists.

On May 20th of that year I sailed for Hong Kong, on the first leg of one of the most important collecting trips I have ever undertaken. While the Nepal expedition for the Indian rhinos was my big objective, I also had other important orders. Incidentally, Philadelphia's zoo also asked for a rhino.

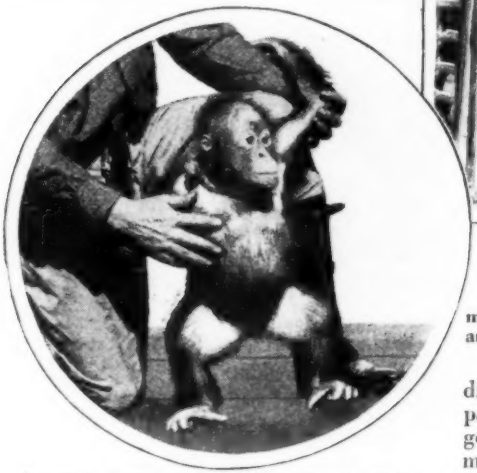
The St. Louis Zoo had commissioned me to secure for them a collection of Indian waders (cranes, storks, flamingoes), also some gib-

the Wild ANIMAL Trail

A rare photograph showing General Shum Shere and attendants with four dead Indian rhinos. The story is told in this article.



In this stockade the rhino calf was securely imprisoned, after its mother was shot, as shown in upper photo. The calf clung near its dead mother while a stout pole fence was closed in around it. Indian rhinos bring about $8000 each.



A young orang-outang looks over America.

bons and antelope. Then there was an order for a whole zoo which I had contracted for with the city of Dallas.

I also had an order from Al G. Barnes, the circus man, for three elephants, two tigers, two tapirs and two orang-outangs.

The New York Zoo, in addition to the Indian rhino, had commissioned me to get a pair of snow leopards, a pair of markhor goats and a few smaller animals. I merely mention these to give you an idea of the extent of my business and the scale on which I was operating.

My diary reveals that I arrived in Singapore on the 28th of June. There I made preliminary arrangements for the trapping, and, in some cases, the purchase of the specimens I was after. Then I sailed for Calcutta.

At Calcutta I had a stroke of good luck. One of the many inquiries designed to help

These magnificent tigers, shown above, are only two of the sixty Frank Buck has put behind the bars. He brought to the United States the only authentic man-eating tiger ever seen in this country.

Mr. Buck with "Baby Boo" on the San Francisco pier. The baby elephant later became a movie star.

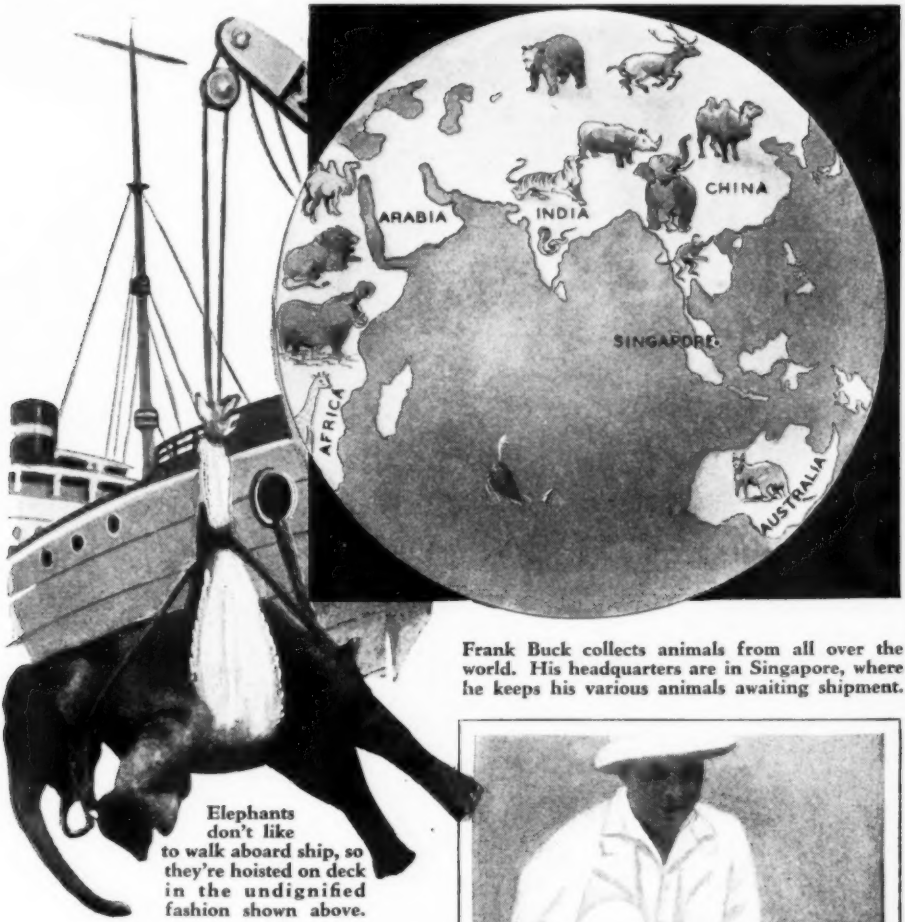
me discover some one who could be helpful in getting me on the right side of the Maharajah of Nepal resulted in the information that General Kaiser Shum Shere, a nephew of the Maharajah, was in town. He had come down from Khatmandu in his official capacity and had established a sort of Nepalese headquarters in Middletown Row, in the European section of Calcutta.

Shum Shere proved to be a dapper little man of about 35, with a dapper little beard. Shum Shere did not waste any time in getting to the point. I could have two Indian rhinos for 35,000 rupees. This is about $12,600. It's a lot of money to invest in a couple of animals that have to travel 16,000 miles before you can hope to get your money back.

We closed the transaction and I was delighted when Shum Shere told me that he would personally head the expedition for the animals I sought. This meant that the job would be intelligently organized and prosecuted, for the general is a truly great shikari, a man who has won the respect of the greatest hunters in Asia.

The deal for the rhinos settled, I decided on a collecting trip that took me through Burma and down the Malay peninsula to Singapore where I wound up with a great many specimens, including elephants, tigers, smaller animals and birds.

It was arranged that I was to keep in touch



Frank Buck collects animals from all over the world. His headquarters are in Singapore, where he keeps his various animals awaiting shipment.

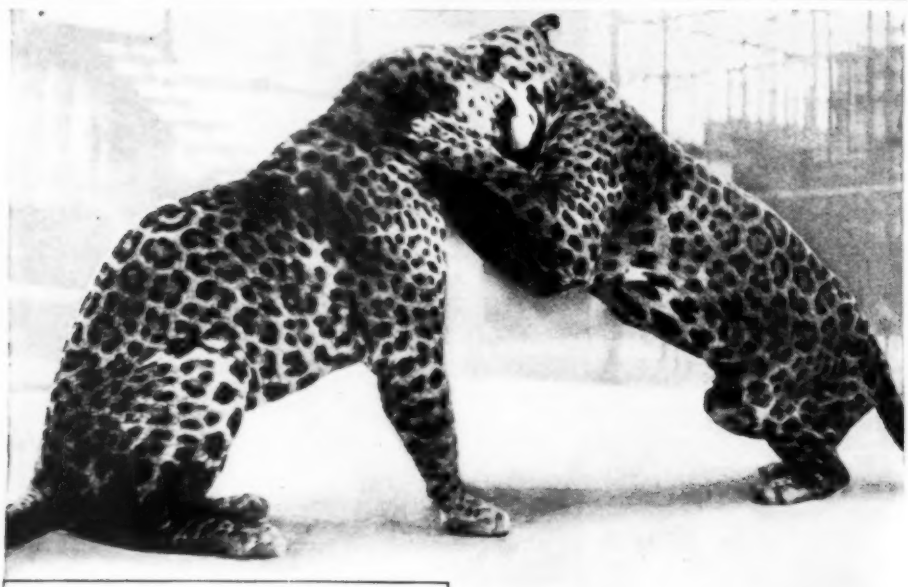
Elephants don't like to walk aboard ship, so they're hoisted on deck in the undignified fashion shown above.

with a representative in Calcutta who was to be notified by Shum Shere after the latter had captured the two rhinos. Then I was to proceed to Nepal for the animals.

After days of reconnoitering, the General, who was working with a force of thirty elephants and well over a hundred Gurkhas, surrounded a female rhinoceros with a good sized calf. He shot down the mother, knowing that the rest was easy. By this I mean that it is well known to those who are familiar with the habits of the rhinoceros family that rhino calf will stand beside the dead body of its mother until decomposition starts to set in.

As the old cow dropped in her tracks, rope fencing, about four feet high and inter-

Three guesses to the identity of this striped little fellow. You're wrong—it's a young tapir. The stripes disappear and his coat becomes a solid dark color as he grows older. This youngster is a little wobbly, but he drinks his milk out of a bottle, straight.



Jaguars come from South America. The two shown here are not fighting — they are merely trying to relieve the tedium in a friendly scuffle.

The proboscis monkey shown in the photo above is the only one ever brought alive to America. He gets his name from his prominent nose.

minably long, was quickly brought up and thrown around the calf, making an enclosure of probably an acre in extent. A small army of Gurkhas managed the rope fencing, and they gradually closed in on the young rhinoceros until it was hemmed within an enclosure only 25 or 30 feet in diameter.

The animal put up a game fight, the General said, it being necessary to use his entire force of men to keep the fencing taut and prevent the baby rhino—(a mere infant weighing about a ton)—from dashing through.

At this point in the proceedings logs and poles were cut from the forest and brought up to the rope corral. These were driven in the ground close together and banked high with earth on the outside. The rhino was left this way for several days, until somewhat weakened and easy to handle.

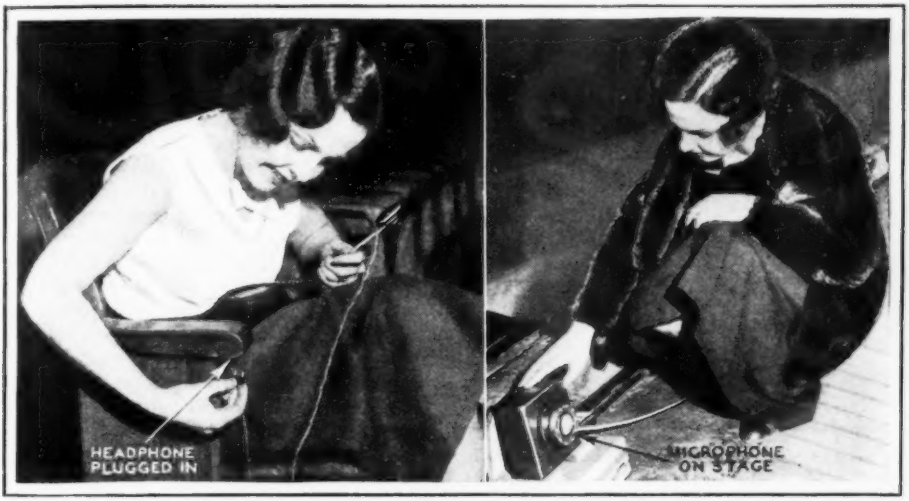
A second calf was captured in the same manner.

They gave me a total of $16,000 for the two rhinos and it would take much bookkeeping to show that I didn't make any money on the deal. As near as I can figure, I broke even.

One of my adventures that I will always remember, which came unfortunately close

(Continued on page 202)

Inventions for Convenience of Theatergoers



By means of the battery of highly sensitive microphones placed at the footlights and connected through high powered amplifiers to the plug-in jacks and headphones at the seats, as shown here, deaf persons are enabled to hear clearly the voices of players on the stage at the Goodman Theater, Chicago. At this theater a special row of seats is provided for persons hard of hearing.

SCIENCE, with its ability to provide helpful inventions for every occasion, has now come to the assistance of theatergoers and furnished them with two new pieces of equipment for increased enjoyment of programs. For the deaf, inventors have devised a system of voice transmission consisting of a battery of "mikes" at the foot lights to pick up the voice of the players, and a series of plug-in connections at seats provided with headphones to convey the voice directly to the ears of the deaf persons. This unique system has been installed at the Goodman theater, in Chicago.

The invention which theater patrons will welcome most heartily, however, is the new adjustable push-back seat which eliminates the nuisance of having to stand every time someone passes along the row. To prevent disorder, to say nothing of much suppressed swearing, the seated person simply moves back by pressing his body against the back of the seat, as demonstrated in accompanying photos. The bottom of the seat is fitted in grooved runners and held in normal position by a spring. Any old seat can be quickly converted by the installation of this simple mechanism.

Standing is unnecessary with this new adjustable theater seat, which permits seated person to move back when someone passes.

New Life Basket Rescues Invalids From Burning Buildings

Helpless invalids are rescued from burning buildings by placing them in this safety basket, which is lowered on the fire ladder with rope. The device works like a car on an inclined railway.

RESCUING helpless invalids from burning buildings has always been a great problem to firemen, but the difficulty is now being overcome by the use of a specially constructed safety basket in which endangered persons can be lowered to the ground with safety. The basket, shown in the photo at the left, is built to run on a fire ladder like an inclined railway leading to the upper stories of the burning building and is raised and lowered by a long rope.

Berlin fire departments are now being equipped with these safety baskets, which have proven successful in every case.

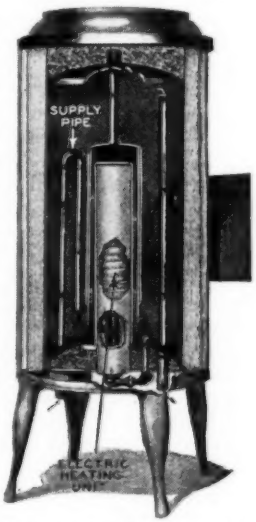
Glass Eaten With Secret Fluid

EATING light bulbs, bottles and tumblers with relish is the amazing feat performed by "Professor" Paul Owen, of New York City. The secret of his performance lies in a fluid which he swallows to render his intestines immune to cuts by the glass.

Paul Owen performing his astounding feat of eating glass. A secret fluid protects his stomach.

Insulated Water Heater Cuts Costs

A NEW and highly efficient type of household hot water heater has recently been perfected which bids fair to revolutionize domestic water heating. The water tank of the heater, shown in the photo at the right, is placed within a sheet iron shell and the space between this shell and the copper tank is filled with many layers of cellular asbestos. Spaces at top and bottom are packed with mineral wool. This insulation so thoroughly seals in the heat that a tankful of water may be kept hot for a period of several days.



Asbestos insulation in this household water heater keeps water hot for several days, effecting a saving in gas.

In a test a tankful of water was heated to a temperature of 150 degrees, and 48 hours later the temperature was 112 degrees.

Artificial Fog Over Orchards Wards Off Late Frost Attack

The artificial fog blanket to protect orchard crops from destruction by frost is generated by means of chemicals which are allowed to drip into the drum of slaked lime when a frost warning comes.

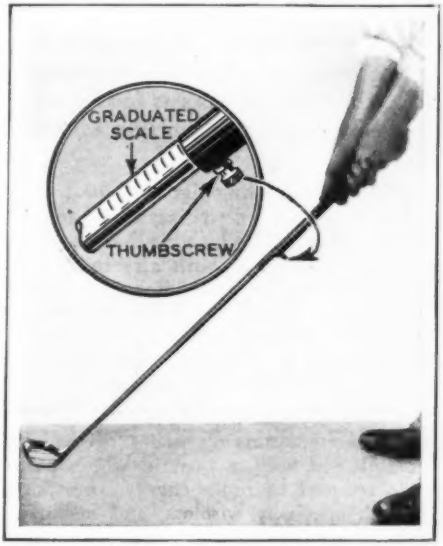
SMOKE screens of artificial fog to ward off disastrous attacks of frost is the means that farmers of Germany are now beginning to employ for protecting their trees when an untimely cool snap occurs. To generate the fog, huge drums filled with unslaked lime are placed at various points around the territory to be protected, as illustrated in the drawing above, and when frost warnings come a solution of sulphur thioxide and chlorine sulphonic acid is released on the lime in the tanks on the windward side of the orchard. The chemical action creates a heavy fog which rises and settles over the orchard to form a protective blanket against the frost.

Electric Eye Cuts Light Bills

ELECTRIC eyes which watch the daylight hour by hour and turn on artificial lights or turn them off at the exact times when this is necessary has effected a large saving in a factory's light bill, it was reported in an engineering magazine. These electric eyes, or photo-electric cells, controlled the power switch of the factory, turning off the current when the light was bright enough outside, and turning it on with the coming of darkness.

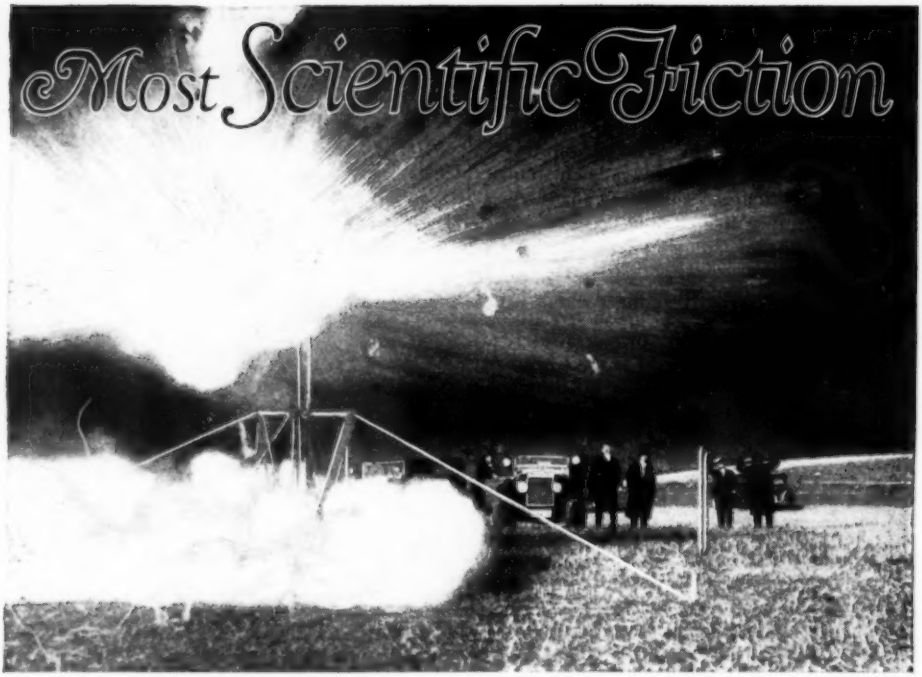
Variable Length Golf Club Handle

YOU can adjust your golf club to any length with a new telescoping handle device, shown below, now on the market. The thumbscrew holds the handle firmly.



Golf clubs can be adjusted to any desired length with the new telescoping handle shown above.

Most Scientific Fiction



A rocket designed by Ludvig Ocenasek, Czecho-Slovakian inventor, blew itself to pieces when tested, as shown above. The inventor hopes to evolve a rocket which will reach the moon under its own power.

by **WILLIAM J. HARRIS**

You've probably read scores of so-called scientific fiction stories, but the chances are you don't know why most of these tales can't possibly come true. Mr. Harris sets forth here the scientific objections to fantastic projects such as transporting a human being by radio and rocketing to Mars.

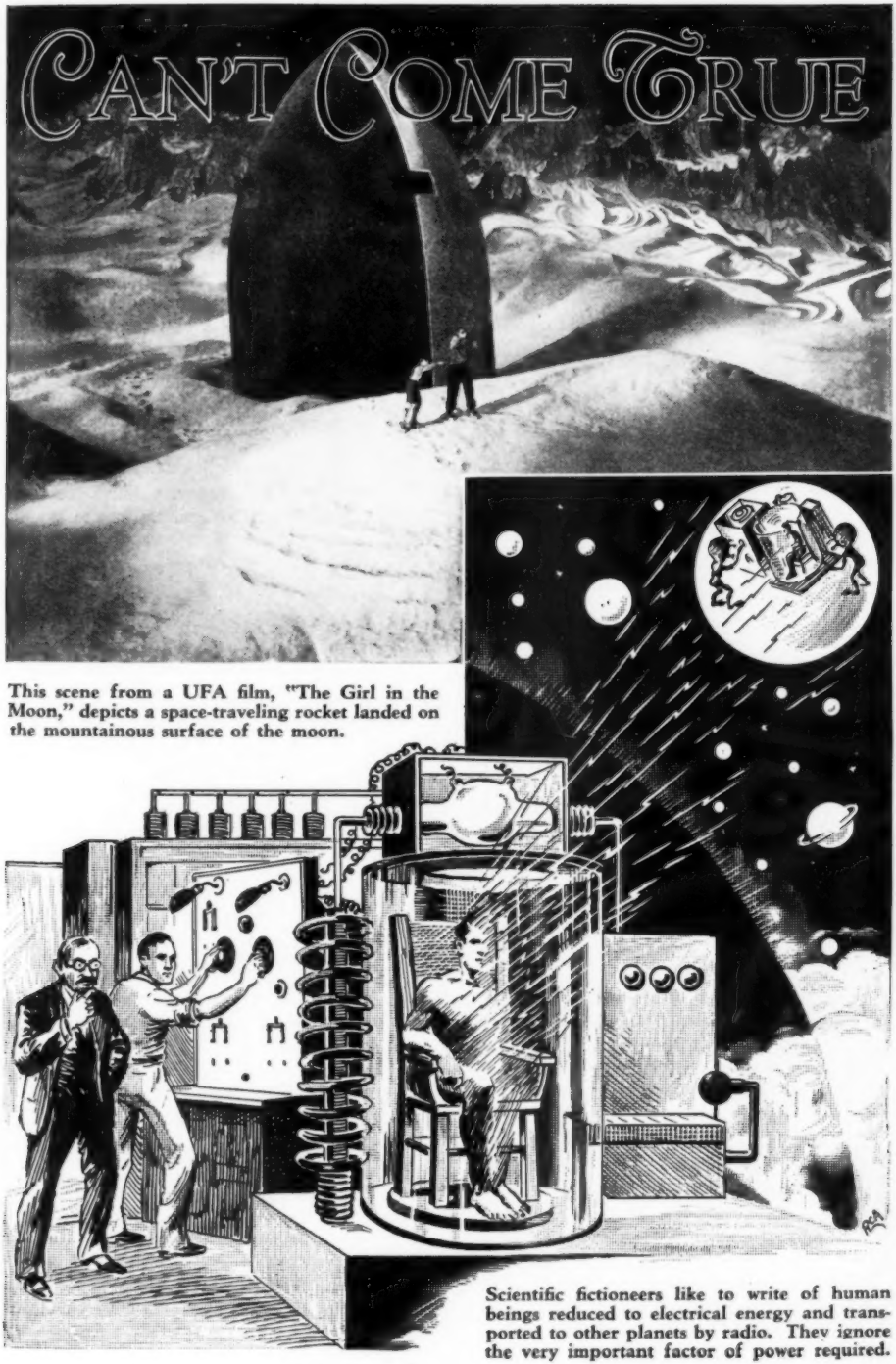
ONE of the leading lights of the pseudo-scientific fiction writing school recently produced a story in which his characters used a marvelous German-built airship to reach an imaginary world in the imaginary hollow center of the earth. The airship was unusual because it contained a vacuum instead of gas, and was built of a mysterious metal so strong it could withstand the enormous air pressure on the outside.

Another entertaining writer of the same ilk followed with a yarn in which people were reduced to radio energy, transported through space by wireless, and instantaneously reassembled at the other end, minus metal fillings of their teeth and any other metal they might have had on their persons.

The writer who transported his characters through the air by radio ignored the power factor, for he had his villain using a portable outfit run by a small gasoline driven generator.

The reduction of a human body to electrical energy and a wireless wave presents a pretty problem. Presumably the body would turn into a wide variety of metals and gases before it could be converted into electrical energy, and at the other end would have to go through a similar process to be reassembled. The hypothesis stated by Prout in 1815 that all elements are aggregates of hydrogen is abundantly borne out by the modern atomic theory, which holds that the atom of any element is a positively charged

CAN'T COME TRUE



This scene from a UFA film, "The Girl in the Moon," depicts a space-traveling rocket landed on the mountainous surface of the moon.

Scientific fictioneers like to write of human beings reduced to electrical energy and transported to other planets by radio. Thev ignore the very important factor of power required.

A rocket traveling to the moon would reach a point in space where gravity was nullified, and consequently occupants would cling to ceilings or hang suspended in the middle of the rocket until their space ship reached a point where gravity began to be exerted again.

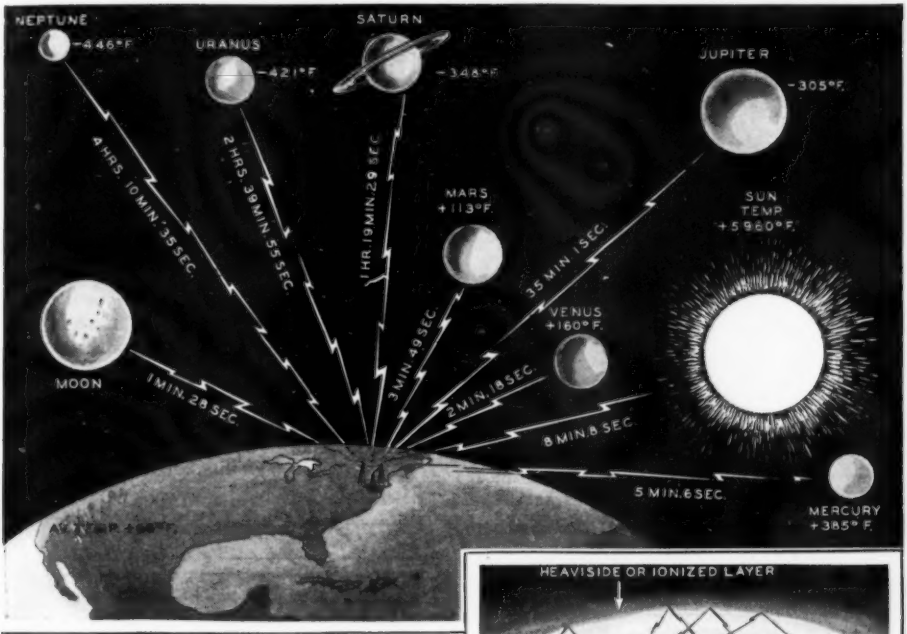
nucleus surrounded by varying numbers of negatively charged electrons.

Experimenters in Germany and in New York in recent years have tried to convert lead into gold by knocking off the extra electrons, and there is reason to believe that that can be done, if sufficient power could be obtained. But the power consumed would be so great that the gold obtained would be the most valuable substance ever dreamed of, for its price would run into hundreds of thousands, if not millions of dollars an ounce.

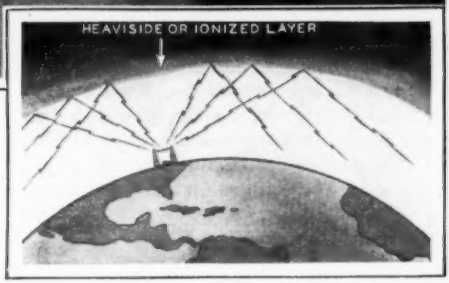
In theory, though, each of the 92 elements in the atomic table could be reduced eventu-

Movie producers like scientific fiction as well as magazine publishers. This space rocket was used in the movie, "Just Imagine." Assuming the ability to generate tremendous quantities of power, such rockets would have to be built with enormously thick walls to withstand air pressure from within.

Characters in the German moon rocket film, "The Girl in the Moon," examine the elaborate space ship which carries them to the moon in the story—although there is no air on the satellite. Photo courtesy of UFA films.



Scientific fiction writers usually ignore the time required to send a radio signal to the planets. The above chart portrays the time element graphically, and also gives the mean temperatures—far above or below those which the human body can endure —that exist on practically all of the planets.



Science has proved the existence of an ionized strata of air (the so-called Heaviside layer, named after the mathematician who predicted its existence) which deflects radio waves back to the earth, and thus makes it impossible for a weak radio signal from earth to penetrate through space.

ally to hydrogen, the lightest of all, by successively changing the atomic structure through removing the excess atoms, and, going a step further, it might be possible to reduce the basic hydrogen atom to electrical energy by dissolving the hold which its nucleus has on its surrounding electrons.

But if such a process were possible and the power to accomplish it were available, then the carbon in one's body, for example, would first turn into boron, and then successively to beryllium, lithium, helium and hydrogen, while the trace of iodine in the human frame, being No. 53 in the atomic table, would have to go through that many steps before it was reduced to the common denominator. And in the process it would become in turn many rare and wonderful things, including krypton, antimony, argon, arsenic, cadmium, gallium, manganese, molybdenum, rhodium, and even silver.

Fortunately the writing of tales of imaginary science doesn't require that the adept stick even to plausible facts, but sometimes the writers in this school of entertainment go to unnecessary pains in inventing startling ideas that are but little better than ordinary truth.

The wonderful vacuum airship, for example, would be so little better than an ordinary gas-filled fabric-covered zeppelin that if the metal hull weighed but 20,000 pounds more than a fabric bag the two would have equal lift—assuming both ships to be of approximately 2,000,000 cubic foot capacity. And the metal vacuum ship, besides being light enough to lift its load, would

(Continued on page 206)

Machine Indicates Distance and Accuracy of Golf Drive

Wally Ford shows Marjorie Peterson her score on the new driving machine. Notice the indicator on the scoring board.

IN THE spring a young man's fancy lightly turns to hooks and slices, and here's a novel means of correcting them. This machine, known as the Cooper Driver, checks up your driving distance and accuracy.

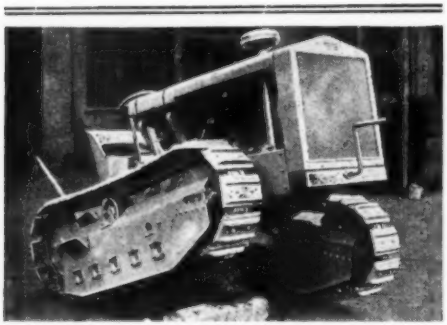
The ball is teed and secured on a metal arm which hammers down on a similar device at the base of the scoring board when the drive is made. This drives another ball up the board to the yardage score which your ball would make. The score depends entirely upon the force of your drive.

A system of lights on top of the score board tells whether you sliced or hooked your drive.

New Tractor Likes Rough Going

A NEW tractor recently developed by a German manufacturer is especially planned for rough and heavy work under the most adverse conditions. Each caterpillar tread is mounted separately so that it can pivot at a most extreme angle without affecting the level of the engine bed and driver's seat or that of the wheel on the opposite side.

The caterpillar units are driven separately from the same engine, and each unit is protected from damage by stout steel fenders in much the same manner as armor is applied to its cousin, the tank. The photo below shows how it can adapt itself to varying conditions.



They can't come too rough for this tractor. Note how the caterpillar pivots over any obstructions.

Youngster Pedals His Own Canoe

Jackie McLean, age four years, of Detroit, is shown stepping along at eight miles an hour in his novel water-bike in the Belle Isle lagoon.

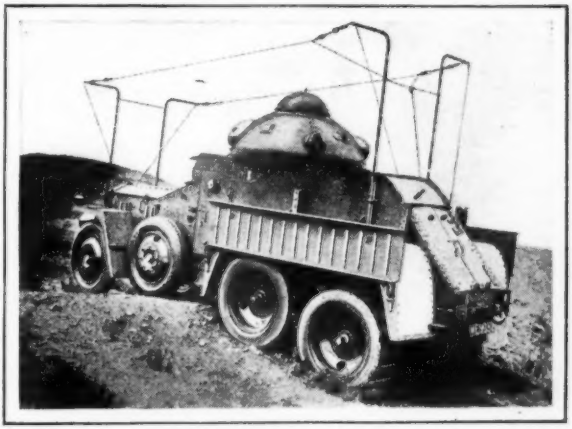
A VARIATION of the old theme, "Paddle your own canoe," is offered by little Jackie McLean, who at the age of four years, navigates his new water bike on the Belle Isle lagoon at Detroit, Michigan.

Jackie's sea-going skiff consists of a small metal boat equipped with water-tight air tanks for safety. In the cockpit of the boat is mounted a contrivance very similar to a bicycle. The pedals operate a small propeller in the rear of the craft which is steered by a rudder operated from the handlebars. The boy has managed to get eight miles an hour from his novel boat. Any workman handy with tools can build one.

Eight Wheeled Armored Car Is Equipped With Wireless

THE Tank Corps of the British army has recently adopted an armored car which is equipped with eight wheels and a long distance wireless sending and receiving set. The car will be used principally for patrolling the rough semi-desert country in Mesopotamia and in India along the Afganistan frontier in conjunction with the present aerial patrol.

Although only a six-wheel drive car, it is so equipped that two spare wheels may be brought into service, giving caterpillar traction over rough ground. The car is heavily armored and is fitted with machine guns and small cannon.



This speedy armored car can negotiate the roughest ground.

Outboard Motor Powers Bicycle

AT a recent automobile show an outboard motor was shown as a power plant for a bicycle. The motor is attached to the handlebars and delivers its power to the front wheel through a friction drive which operates directly on the tire.

Miss Marie Laucelle is shown demonstrating the new outboard motor front-wheel drive for bicycles.

Machine Detects Dizziness

THOSE who would try to hide their big parties from the boss or wife had now better return to the straight and narrow path, for a device has been perfected which will bring out that morning after feeling, so that even the fragrance of cloves will be useless.

This little machine is known as a "wobble" meter, and consists of a low platform which teeter-totters sidewise and from front to back. When you stand on it you constantly shift your weight from one leg to the other, swaying the body. The more tired you are the more rapidly you sway.

Staking out a BILLION

This picture gives you an idea of the treacherous jungle swamps through which the army engineers must battle with transit, rod and level. Venomous snakes and insects abound in sweltering tropical jungle.

Through tropical jungles, treacherous torrents, and mountain passes the United States army engineers have been fighting for over a year to stake out a new link between the Atlantic and Pacific Oceans. This Herculean engineering feat will take ten years to complete and will cost our country a billion dollars. This article gives you a picture of the difficulties now being surmounted in Nicaragua.

FOR a little over a year a picked battalion of United States army engineers has been foraying through matted jungle regions and over perilous mountain passes in making a survey for the proposed Nicaraguan Canal, to link the Atlantic and Pacific oceans for a distance of 183 miles.

The decision of the American government to construct a canal over the surveyed area, a project which will require ten years, will depend on the reports of the engineers down there at present. The United States is prepared to spend $1,000,000,000 in the event that conditions warrant the construction of a canal to relieve the traffic on the Panama. The latest report of the engineers, however, places the estimate at between $500,000,000 and $700,000,000.

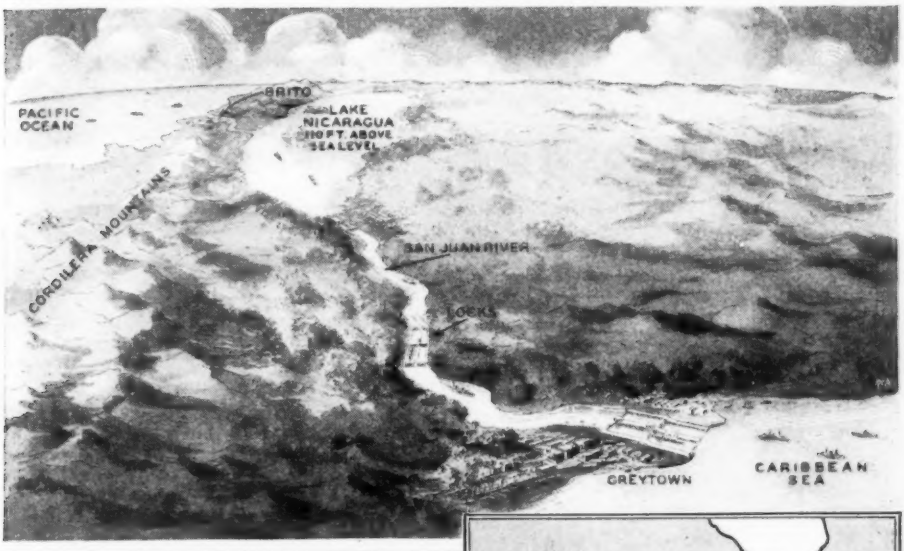
Major Dan I. Sultan, of the office of the chief of engineers, was appointed by President Hoover to supervise the work of the army engineers. The workers have been fighting their way through the treacherous waters of the San Juan River from Greytown, their base of operations, and forging over the broad Lake Nicaragua to the Cordilera mountain range. It is this barrier which forms the divide between the eastern and western slopes.

Explorations and surveys have been going on in this region ever since 1826.

Later, between 1850-1852 the famous so-called instrumental survey was made by Colonel Childs. Congress was on the verge of appropriating funds for the undertaking but some great stumbling-block, now lost in the maze of history, appeared to obstruct the

DOLLAR CANAL

by ALFRED ALBELLI



A bird's-eye view of the canal as it will appear when completed. The San Juan River will be dammed to provide deep water through the hilly country, while a deep channel will be dredged through the muddy bottom of Lake Nicaragua.

work and it was abandoned. As many as five other surveys followed. The data gathered during all of these is being availed of in the course of the present study.

According to the present proposals, the Atlantic end of the canal will be Greytown where two jetties and a harbor, two miles long, will be constructed. From there the Canal will run along the north side of the San Juan River, which would be changed into an arm, fifty miles long, to Lake Nicaragua. At Conchuda it is planned to have a dam.

Across Lake Nicaragua the engineers are making soundings and maps for a channel. This channel, which will be seventy miles long, will have to be dredged. Then it will pass through the continental divide, west of Lake Nicaragua, and dropped to the level of the Pacific Ocean by means of four locks, this distance being 16 miles.

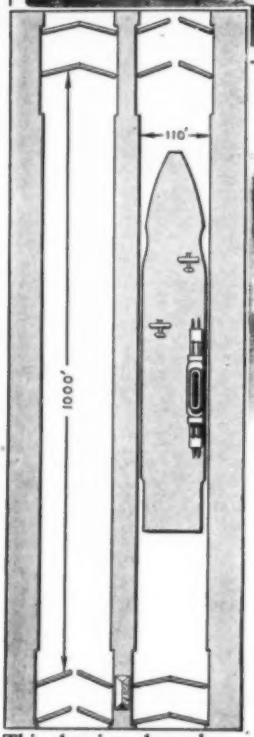
Tentative plans call for a dredged harbor and a jetty at Brito on the Pacific side. The maximum elevation of Lake Nicaragua above

This map shows the location of the two canals, and illustrates how ships will save from two to four days on the New York - San Francisco run.

sea level is about 110 feet. The lower part of the San Juan River is the boundary between Nicaragua and Costa Rica. It may be that this river may have to be dammed, thereby

American Army Engineers Fight Tropical Jungles With Transit and Rod

Camp Hoover, the base on the San Juan River, from which the army engineers worked in staking out the route of the Nicaraguan canal.



This drawing shows how the Panama locks limit the size of Naval vessels.

U. S. Army sounding the depth of the treacherous San Juan River prior to employing diamond point drills to test the underlying soil.

changing its natural flow characteristics. The survey has now been completed. Now the government's Canal Board will study the advisability of entering on an engineering project which will require 20,000 men ten years to complete. Meanwhile, the army engineers, working as a unit entirely apart from the Marine Corps stationed in that politically-turbulent country, continue to record the topography and the character of the waterways by transit, rod and chain, leading a primitive existence amid tropic hazards, striving to transplant to a land which never grew up the civilization of the North.

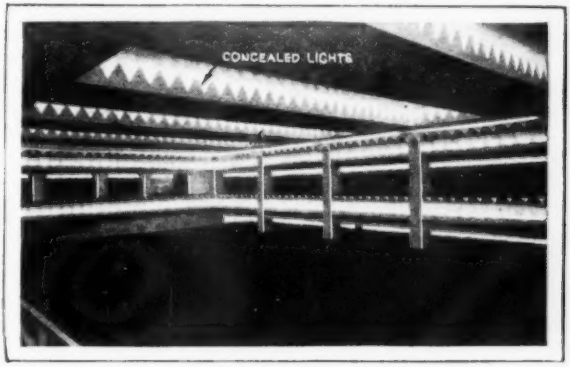
Aside from its commercial advantages, which a glance at the map will make apparent at once, the canal will more than pay for itself should this nation ever be threatened by one of the great naval powers. In event of hostilities, it is presumed that one of the first things attempted by the enemy would be the destruction of the Panama Canal locks, thus making it impossible to transfer the fleet from one coast to the other. With two canals, the probability of cutting this important link in communications would be cut in half. The Nicaragua Canal would also be easier to defend, owing to its topographical advantages.

Painting With Light Is New Mode of Interior Decoration

COLORAMA, or "painting with light," was recently introduced in the great ballroom of the St. George Hotel of Brooklyn, this being the first time this new type of lighting has been installed on a large scale.

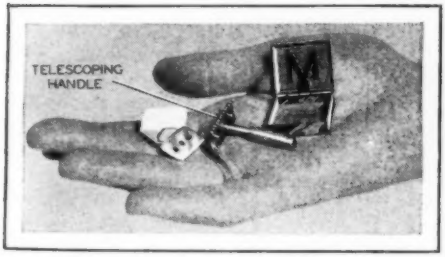
The ballroom, one of the largest in the country, has a clear ceiling height of 29 feet and 6 inches, has an unobstructed floor area of 9500 square feet, and is without windows or visible ceiling or wall lighting fixtures. The entire room is painted in a flat white finish to serve as the "canvas" upon which a master artist paints the room's decorations—solely with lights. A hundred thousand variations of colors and patterns are possible with the system of decorating. The designs and colors may remain fixed, or move according to any predetermined plan. Thus the ballroom may be a cool, light green and blue for luncheon, white and amber for afternoon bridge, or in deep rich, formal reds and browns for an evening banquet.

The painting with light, in the case of the St. George Hotel, is spread upon the walls from a remote control board, approximately four by six feet in size, with more than 500 control buttons. Were this system of control to be operated by manual labor it would require eight men on the switchboard, but through the use of remote control one man is able to operate the entire system.



Although six thousand light bulbs are used, none are in sight.

Smallest Safety Razor in World



The handle telescopes and unscrews from blade.

THIS tiny gold-plated safety razor, which is complete in every respect, and in perfect working order, fits into a tiny snap case which is smaller than a half dollar. The set has been designed for ladies' use.

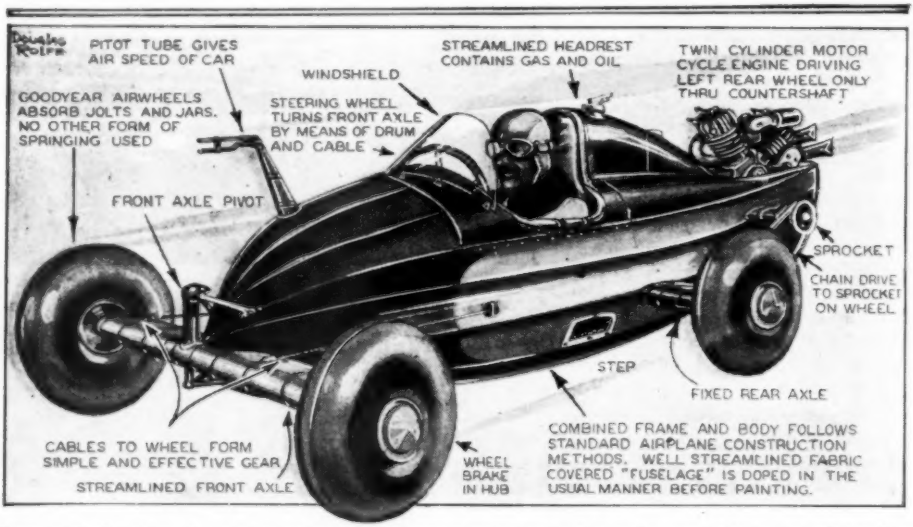
Water System for the Bird House

HAVE you had a plumber fix up your bird house? The up-to-date bird home is all fixed up with water—not exactly running — but at least at hand—not within, but just outside the door. The plumbing installation takes about 5 minutes, and cost a nickel, the price of a tin pie pan at the variety store.

Nail a bracket just below the bird house, extending forward, about 12 inches long. On this nail a round piece of thin wood, or another piece at right angles with blocks at the ends to cause the pie tin to set level. Then put the pan in place and drive small nails right by the rim at the four points of support, letting the nail heads hold the pan permanently in place.

Put a cup of water in this pan every summer morning and see how quickly the birds show their appreciation. This stunt will also usually cause birds to take up their abode in a house that has so far remained vacant.

PRIZES for Home-Built


PITOT TUBE GIVES AIR SPEED OF CAR
WINDSHIELD
STREAMLINED HEADREST CONTAINS GAS AND OIL
TWIN CYLINDER MOTOR CYCLE ENGINE DRIVING LEFT REAR WHEEL ONLY THRU COUNTERSHAFT
GOODYEAR AIRWHEELS ABSORB JOLTS AND JARS. NO OTHER FORM OF SPRINGING USED
STEERING WHEEL TURNS FRONT AXLE BY MEANS OF DRUM AND CABLE
FRONT AXLE PIVOT
SPROCKET
CHAIN DRIVE TO SPROCKET ON WHEEL
STEP
FIXED REAR AXLE
CABLES TO WHEEL FORM SIMPLE AND EFFECTIVE GEAR
STREAMLINED FRONT AXLE
WHEEL BRAKE IN HUB
COMBINED FRAME AND BODY FOLLOWS STANDARD AIRPLANE CONSTRUCTION METHODS. WELL STREAMLINED FABRIC COVERED "FUSELAGE" IS DOPED IN THE USUAL MANNER BEFORE PAINTING.

Suggested ideas for the construction of the aero racer pictured on this month's cover of Modern Mechanics and Inventions are presented in this drawing. A motorcycle engine is used for power.

IT'S a safe bet to say that at one time or another practically every man in America has built himself a home-made vehicle embodying his own ideas in automotive construction. Maybe it was only a pushmobile made to imitate his favorite car; maybe, as he grew older, he turned out a race car job, or put a racing body on a chassis powered by a motorcycle engine. The longing for a means of mechanical transportation is universal. That's why MODERN MECHANICS AND INVENTIONS is announcing a big new prize contest in which cash awards of $200 will be distributed among the builders of the most pleasing home-made autos. If you've already built a home-made car, all you have to do is take a snapshot of it and send it in, under the rules of the contest. If you haven't built your car yet, start in at once—you have until August first to complete the job and submit your entry, and the suggested plans appearing on these pages will help you get started.

Prizes as announced in the box on this page will be awarded on a basis of originality of design and workmanship. Cars must be powered with gasoline motors of not more than four cylinders. Autos should not be too elaborate—they should make use of cheap or scrap materials so that other mechanics who might wish to duplicate the design can do so without great cost. When your car is built, send in a snapshot, together with a description of its construction, an estimate of cost and of the speed it develops, to the Auto Contest Editor, MODERN MECHANICS AND INVENTIONS, Minneapolis, Minn.

Now to give you a few pointers on how to build an ingenious, low cost baby car. The

Win $100 With Your Home-Built Car

Here are the prizes Modern Mechanics and Inventions will award builders of the best baby autos, according to the contest rules printed on page 106:

First Prize - - -	$100
Second Prize - - -	50
Third Prize - - -	25

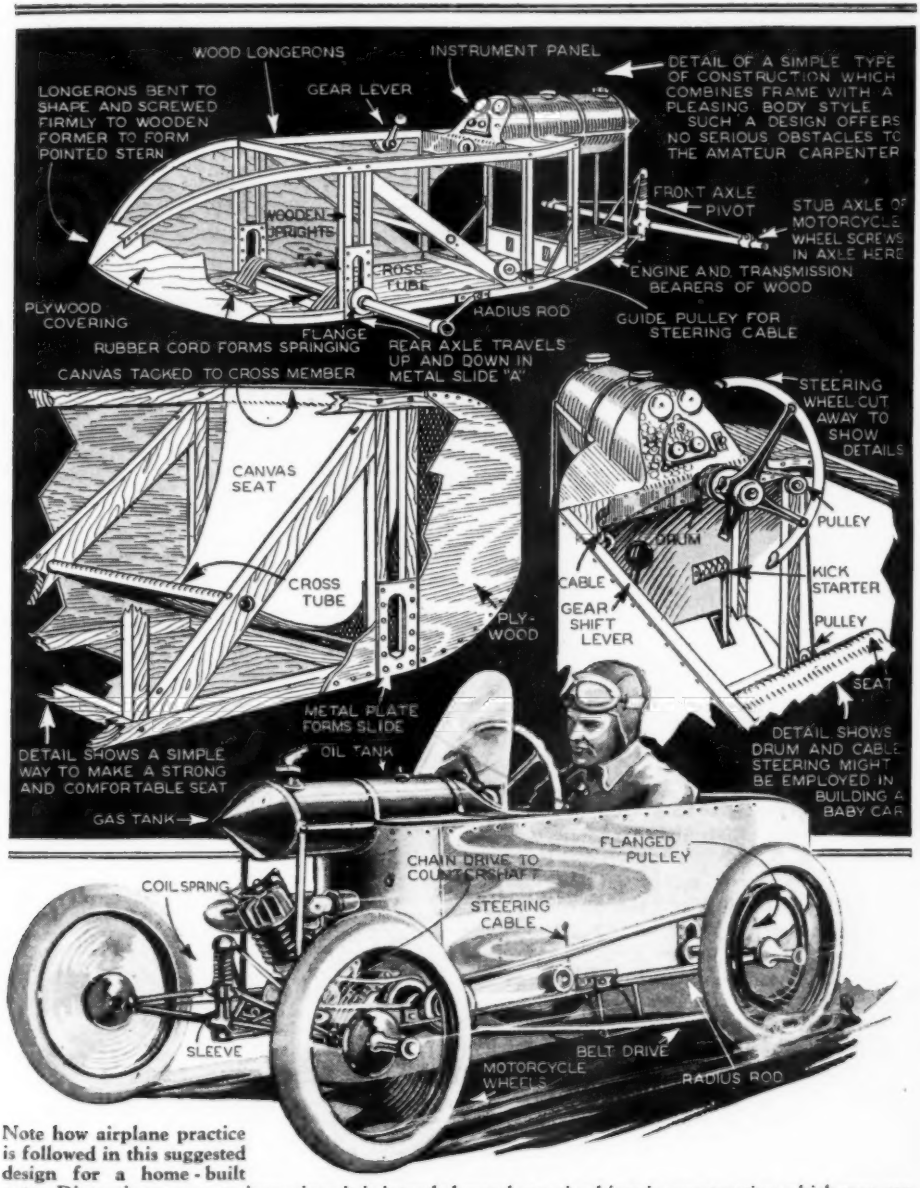
and five fourth prizes at $5 each.

Entries must be received on or before August 1, 1931. Address them to

Auto Contest Editor
Modern Mechanics and Inventions
529 So. Seventh St., Minneapolis, Minn.

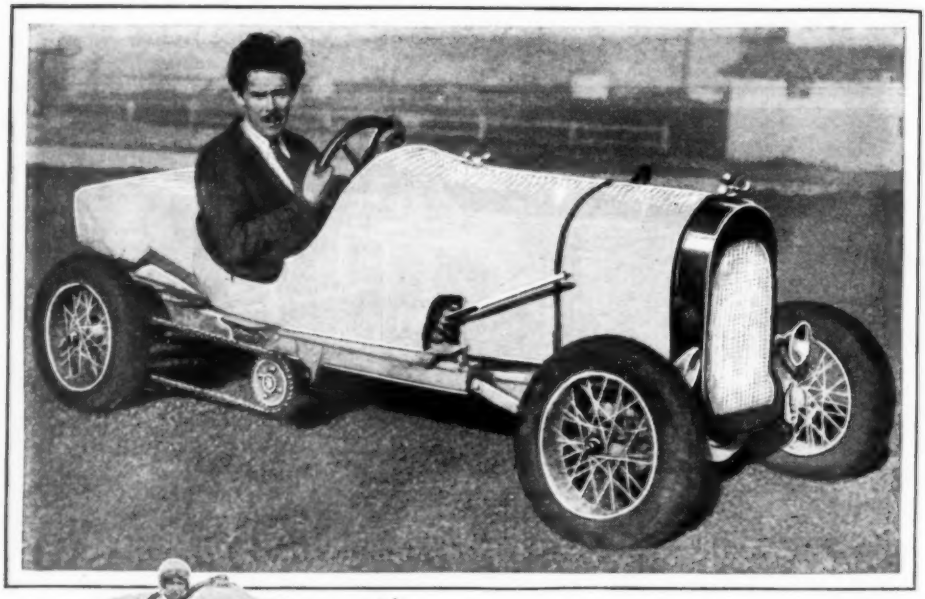
BABY AUTOS

You Can Win a Cash Award See Below

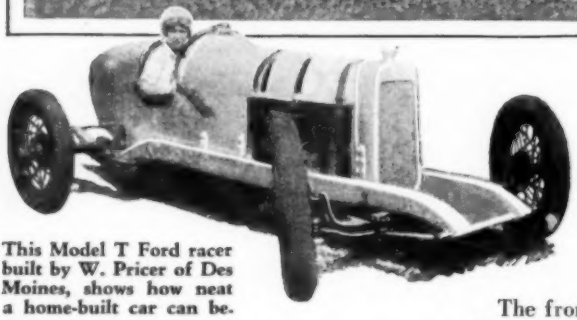

WOOD LONGERONS
INSTRUMENT PANEL
DETAIL OF A SIMPLE TYPE OF CONSTRUCTION WHICH COMBINES FRAME WITH A PLEASING BODY STYLE. SUCH A DESIGN OFFERS NO SERIOUS OBSTACLES TO THE AMATEUR CARPENTER
LONGERONS BENT TO SHAPE AND SCREWED FIRMLY TO WOODEN FORMER TO FORM POINTED STERN
GEAR LEVER
FRONT AXLE PIVOT
STUB AXLE OF MOTORCYCLE WHEEL SCREWS IN AXLE HERE
WOODEN BRIGHTS
CROSS TUBE
ENGINE AND TRANSMISSION BEARERS OF WOOD
PLYWOOD COVERING
RADIUS ROD
GUIDE PULLEY FOR STEERING CABLE
FLANGE
RUBBER CORD FORMS SPRINGING
REAR AXLE TRAVELS UP AND DOWN IN METAL SLIDE "A"
CANVAS TACKED TO CROSS MEMBER
STEERING WHEEL CUT AWAY TO SHOW DETAILS
CANVAS SEAT
PULLEY
DRUM
KICK STARTER
CABLE
CROSS TUBE
GEAR SHIFT LEVER
PLY-WOOD
PULLEY
SEAT
METAL PLATE FORMS SLIDE
OIL TANK
DETAIL SHOWS A SIMPLE WAY TO MAKE A STRONG AND COMFORTABLE SEAT
DETAIL SHOWS DRUM AND CABLE STEERING MIGHT BE EMPLOYED IN BUILDING A BABY CAR
GAS TANK
FLANGED PULLEY
CHAIN DRIVE TO COUNTERSHAFT
COIL SPRING
STEERING CABLE
SLEEVE
BELT DRIVE
MOTORCYCLE WHEELS
RADIUS ROD

Note how airplane practice is followed in this suggested design for a home-built auto. Dimensions are not given, since it is intended merely to give hints in construction which you can make use of in building a baby auto to enter in the prize contest announced on the opposite page. Practically all parts shown here can be secured cheaply from an auto junk yard in your neighborhood. The use of airplane shock cord on the axles eliminates the need for metal springs. Addition of a streamlined cowling to the front of the car will improve performance and increase speed considerably.

Here Are Two Snappy Home-Built Jobs Which Give Construction Hints



Here's car built by Ward C. James, Los Angeles stunt man. Note the chain drive—a method easily adapted by the amateur race car builder.



This Model T Ford racer built by W. Pricer of Des Moines, shows how neat a home-built car can be.

drawing on page 104, and on the cover of this magazine, illustrates an aero racer which makes use of the principles employed on some of the fastest airplanes. The body of the car is streamlined, the twin cylinder motorcycle engine mounted at the rear, turning the left rear wheel by a chain drive. Air wheels of the type employed on planes are used; these have the advantage of coming with brakes in the hub. They are practical for small cars, too—on another page of this magazine is an exclusive story announcing successful trials of this type of tires for use on trucks and buses. Soon they will be commonplace on passenger cars.

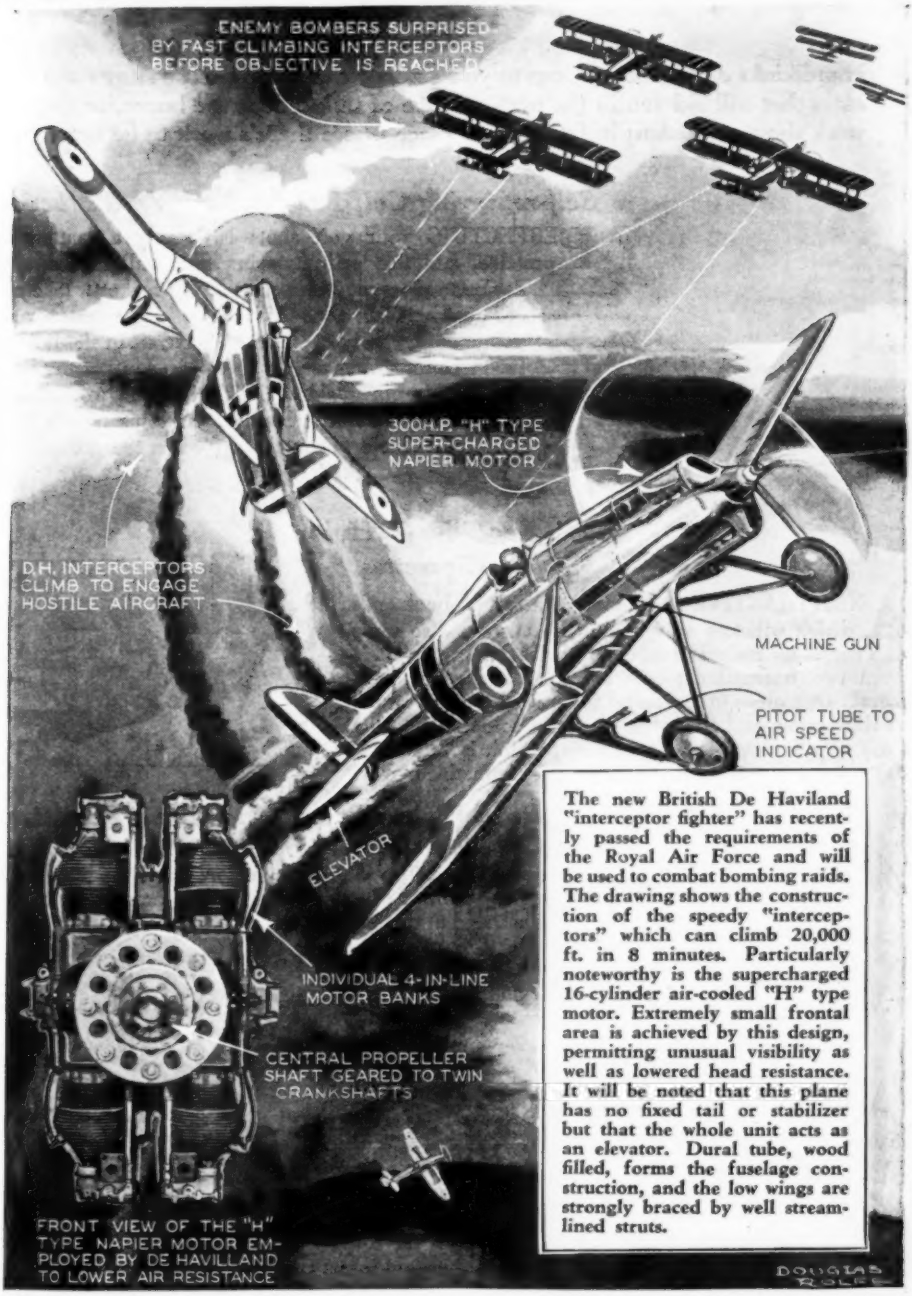
The front axle is streamlined with a fairing and fixed to pivot in its center. Other suggested details of construction are given in the drawing. No dimensions are included, since it is intended to serve simply as an idea which you can modify or adapt in any way you see fit.

The drawing on page 105 shows another small car with a one-lung motorcycle engine, employing a different type of drive, a belt being used. This enables you to make use

(Continued on page 194)

CONTEST RULES—For photos of the best home-built baby autos, powered by gasoline engines of not more than four cylinders, accompanied by brief descriptions of construction and statement of speed developed, Modern Mechanics and Inventions will award a first prize of $100, a second prize of $50, a third prize of $25, and five fourth prizes of $5 each. Decisions of the judges are final. Photographs or manuscripts will not be returned unless a stamped, addressed envelope is enclosed. In case of ties, duplicate prizes will be awarded. Anyone may compete except employees of this magazine, or their families. It is not necessary to buy a copy of this magazine or to be a yearly subscriber. Photographs and manuscripts should be submitted in the same envelope, and photos should bear return address on the back. Entries must be postmarked on or before August 1, 1931. Address Auto Contest Editor, Modern Mechanics and Inventions, 529 South Seventh Street, Minneapolis, Minn.

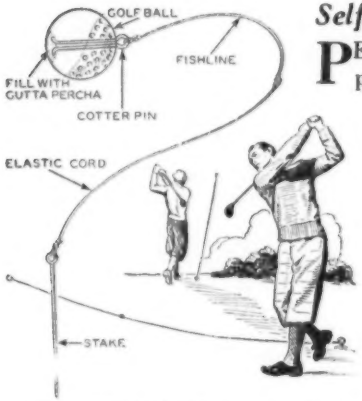
Interceptors Are England's Defense Against Bombers


ENEMY BOMBERS SURPRISED BY FAST CLIMBING INTERCEPTORS BEFORE OBJECTIVE IS REACHED
300 H.P. "H" TYPE SUPER-CHARGED NAPIER MOTOR
D.H. INTERCEPTORS CLIMB TO ENGAGE HOSTILE AIRCRAFT
MACHINE GUN
PITOT TUBE TO AIR SPEED INDICATOR
ELEVATOR
INDIVIDUAL 4-IN-LINE MOTOR BANKS
CENTRAL PROPELLER SHAFT GEARED TO TWIN CRANKSHAFTS
FRONT VIEW OF THE "H" TYPE NAPIER MOTOR EMPLOYED BY DE HAVILLAND TO LOWER AIR RESISTANCE
DOUGLAS ROLFE

The new British De Haviland "interceptor fighter" has recently passed the requirements of the Royal Air Force and will be used to combat bombing raids. The drawing shows the construction of the speedy "interceptors" which can climb 20,000 ft. in 8 minutes. Particularly noteworthy is the supercharged 16-cylinder air-cooled "H" type motor. Extremely small frontal area is achieved by this design, permitting unusual visibility as well as lowered head resistance. It will be noted that this plane has no fixed tail or stabilizer but that the whole unit acts as an elevator. Dural tube, wood filled, forms the fuselage construction, and the low wings are strongly braced by well streamlined struts.

HANDIKINKS

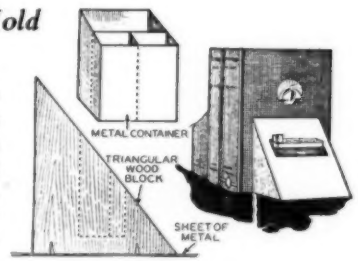
Handikinks department brings to you a number of helpful little stunts and ideas that will aid you in the performance of tasks about the house, in the work shop or garden; in fact, in any place where there's work to be done.



Self-retrieving Golf Ball for Back Yard Practice

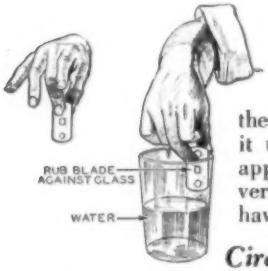
PERFECTING your golf shots is largely a matter of practice, and this self-retrieving golf ball is just the device to give you this practice. To make it, take an old golf ball, bore a 3/16 in. hole in the center, and gouge out a cavity in the end. Next, fit in the hole a heavy cotter pin as shown in the drawing at the left, and to this pin attach a five-foot stout cord. Splice this cord to an elastic band of the same length, and anchor the band to a stake driven in the ground, as illustrated.—L. B. Robbins.

Book Ends Hold Cigarettes



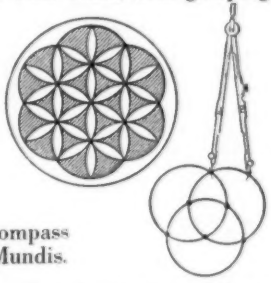
AN ATTRACTIVE and serviceable pair of book ends which will not only support books but also serve as a container for matches, cigarettes, etc., may be made from two triangular pieces of wood and some sheet metal. One piece of the metal is screwed to the bottom, as illustrated, and the other bent and soldered into the form of a removable compartment, which is fitted into the mortise in the triangular block.—Kenneth Murray.

Tumbler of Water Makes Handy Blade Sharpener



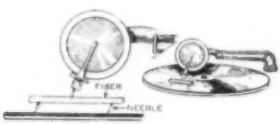
THE most efficient sharpener for dulled razor blades is available if you can lay hands on an ordinary tumbler. The method is as follows: Fill the glass with water, then grasping the blade as illustrated at the left, move it up and down three or four times, applying pressure with the thumb. Reverse the blade and repeat, and you will have a sharp cutter.—A. J. MacMillan.

Circles Form Attractive Designs



AN ORDINARY compass is all you need for making attractive designs on a piece of furniture, on glass, or what have you. Simply lay out the design as illustrated here, using the compass to inscribe the circles, then trace them on your work.—Warren Mundis.

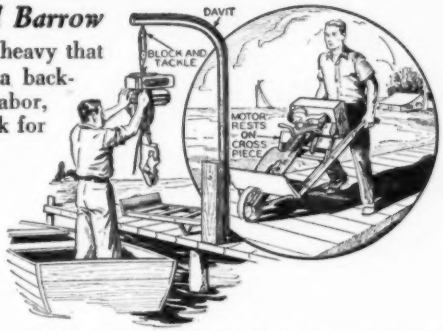
Simple Phonograph Attachment Improves Tone



TO IMPROVE the tone of your phonograph, take a short piece of fiber and insert two needles in the under side, as illustrated at the left. Then fit the regular needle in a small hole in the top, so it rests on the fiber.—Hans Kutschbach.

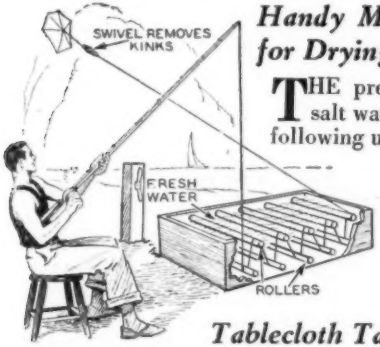
Novel Stunts for the Outdoor Man

Handling Outboard With Davit and Barrow



MOST outboard motors now in use are so heavy that handling them in and out of boats is a back-breaking task. You can save yourself a lot of labor, however, by rigging up an old davit on the dock for lowering the motor into the boat. And for carrying the motor to the dock, you can equip an ordinary wheelbarrow with a cross piece, as illustrated here.—J. E. Hogg.

Handy Method for Drying Line



THE preservation of fishing line, particularly line used in salt water, depends largely upon proper cleaning and drying following use. Washing and drying up to 500 yards of line, however, will be a simple task if you construct the novel dryer illustrated at the left. The line is washed by paying it out through fresh water in the trough and then sending it aloft by means of a kite for a thorough drying. After drying, the line is wound up and the kite removed.—James Gordon.

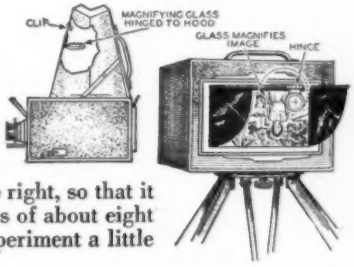
Tablecloth Tab Keeps Napkin Clean

PICNICKERS know what a nuisance it is to have the wind come along, sweep up a nice clean napkin and drop it down in the dirt. One clever outdoor man overcame this difficulty by sewing tabs to the tablecloth and inserting the napkins under them when not in use. These tabs should be of the same material as the tablecloth, and about one inch wide and three inches long. You can sew on as many as you want, depending on how many persons there are in your party.—J. N. Stoody.

Quick Polisher for Fish Lures

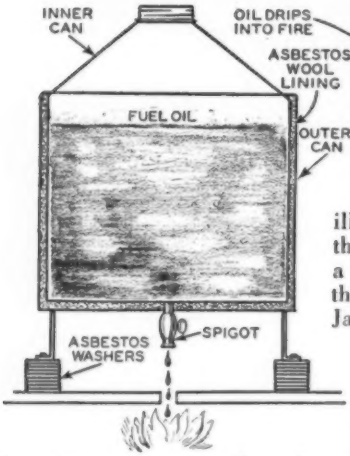
IF YOU want results when fishing for bass, trout, salmon and other such game fish, you'll have to keep your spoons polished. To save a lot of labor at this task, obtain a scrap of sheep skin from a tanner and make a ring of it to fit around the flywheel of your boat motor. Then spoons can be polished in short order by simply holding them against the revolving wheel.—John Edwin.

Magnifying Glass Aids Focus



A MAGNIFYING glass mounted on your camera will aid you immensely in making photos that are sharp in detail, because with it you can get an almost perfect focus on the subject. If you possess a camera with a focusing panel, attach a magnifying glass by fitting it with a hinge, as illustrated in the drawing at the right, so that it is focused on the ground glass panel. A magnifying glass of about eight diameters is the most suitable size. You may have to experiment a little to get a good focus.—Donald Masters.

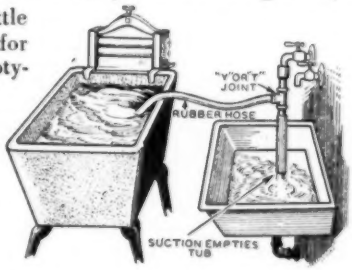
Ideas for the Man about the House



Simple Oil Burner Saves Fuel

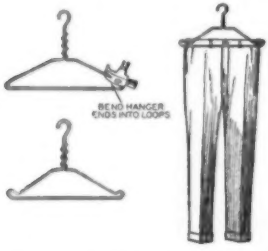
HERE'S a simple and inexpensive oil burner which can be easily constructed and fitted to any coal or wood burning stove to cut fuel costs. Two metal cans of quart capacity are used, one fitting inside the other, the space between being filled with light asbestos wool for heat insulation, as illustrated at the left. Fitted to the inner can and passing through the bottom of the outer one, is a metal spigot with a valve to regulate the flow of oil. The fuel oil drips down through a hole in the plate and onto the asbestos wool.—Jas. Mason.

Hose on "Y" Joint Empties Tubs Quickly



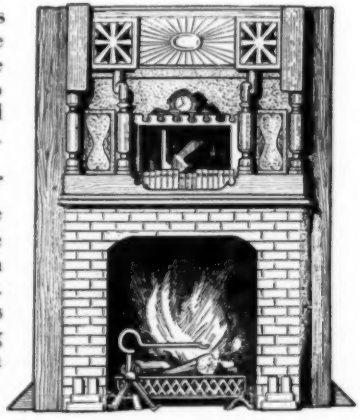
AVERY handy little contrivance for expediting the emptying of water from laundry tubs can be rigged up by screwing a short piece of pipe to each end of a "Y" or "T" joint, and attaching to these pipes short lengths of rubber hose, as illustrated in the drawing at the right. The tub can be filled by clamping the lower hose, and emptied by simply turning on the water, which creates a suction in the hose leading from the tub and quickly empties it.—Henry J. Musser.

Wire Hanger Bent Into Loops Holds Trousers



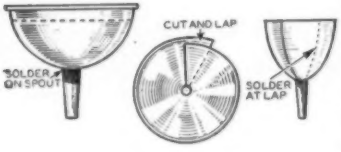
COAT hangers may be converted into handy and serviceable trousers hangers by the simple bending operation demonstrated in the drawing at the left. This can be accomplished with an ordinary claw hammer, which is inserted in the extremities of the hanger to bend them into loops.—Herman Mann.

Out-of-Style Organ Makes Mantel for Fireplace



OLD style organs which were attractive pieces of furniture in their day can still be used to decorate your home as mantels above fireplaces. Simply saw the organ in two below the bookrack and place this top upside down above the fireplace, the sawed off end against the ceiling, as illustrated.—Mrs. A. M. Phillips.

Durable Funnel From Headlight Reflector

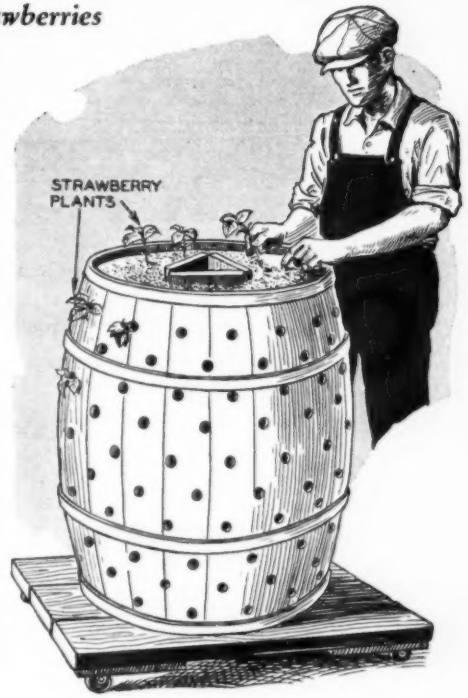


VERY handy and durable funnels can easily be made from old headlight reflectors by soldering to the light socket hole a spout made of copper. Cut and overlap as shown in the drawing at left to make a smaller funnel.—J. G. Hanna.

Helps for the Farmer and Gardener

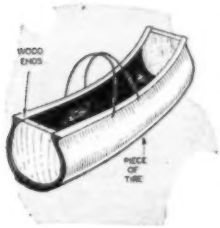
Old Barrel Makes Bed to Raise Strawberries

RAISING strawberries on the outside of a barrel is an experiment well worth trying. First, obtain an ordinary sugar barrel and bore in it ten rows of ¾ in. holes, the rows being eight inches apart and staggered as shown. The barrel is then set on a platform with casters so that it can be turned every few days to give sunlight to the plants. Three boards are placed in the center for drainage and the strawberry plants set in the holes. Any good, rich soil will do nicely, provided it is kept watered. —Eugene Keyarts.



Handy Garden Tool Kit From Tire

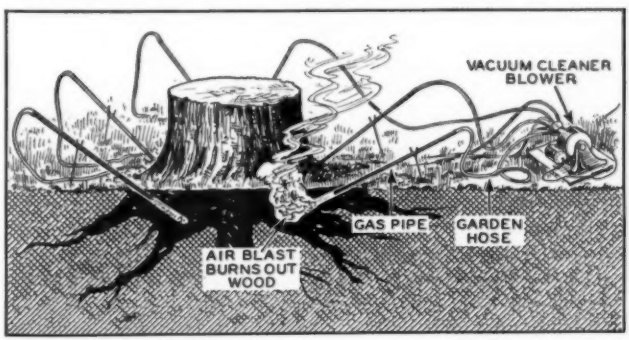
A HANDY kit for your garden tools may be made from a piece of old tire casing. Two pieces of board are cut with a hack saw and nailed to the ends, as shown at left, and two wires looped through the beading to form the handle.—Theo. Allen.



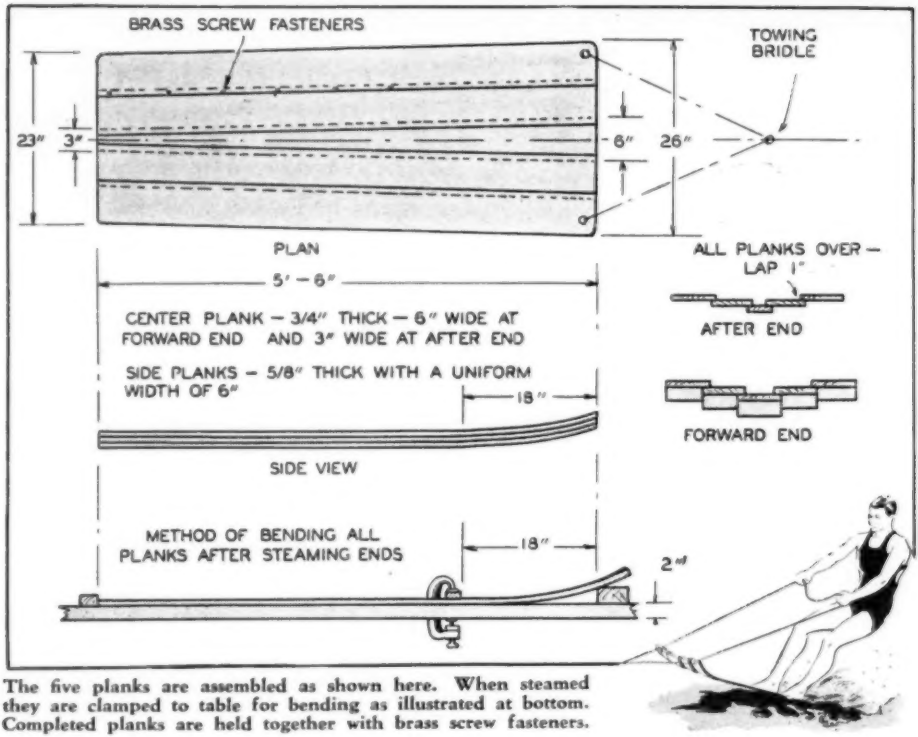
Vacuum Cleaner Blower Creates Forced Draft for Burning Out Stumps

REMOVING large stumps with a minimum of time and effort can be accomplished by the scheme now being employed by farmers in many parts of the country—the forced draft method, which requires only a blower of the type used in an ordinary vacuum cleaner, a few lengths of gas pipe and some ordinary garden hose. First, using a ship auger with a 24-inch twist, bore a number of horizontal holes eight to thirty inches long in the stump, close to the ground, uniting them in the center.

When starting the fires, the holes are filled with charcoal or other intense heat producing materials and saturated with gas. After lighting the fire the air is turned on to fan the flames, the pipes being drawn back enough to keep them from getting red hot. When the fire is going strong remove the pipes and allow the flames to burn alone. Pieces of scrap sheet iron should then be placed over the holes to confine the heat to the stump, which will burn out in a few days. It may then be split and the burning finished, or rolled to one side. In this manner you can destroy the stumps thoroughly.—Miss E. V. Dunn.



Aquaplane for Watersport Thrills

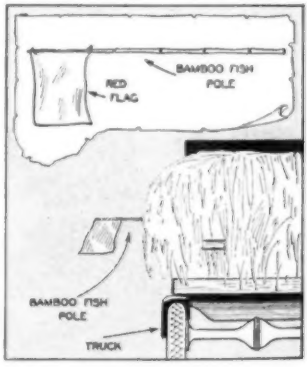


The five planks are assembled as shown here. When steamed they are clamped to table for bending as illustrated at bottom. Completed planks are held together with brass screw fasteners.

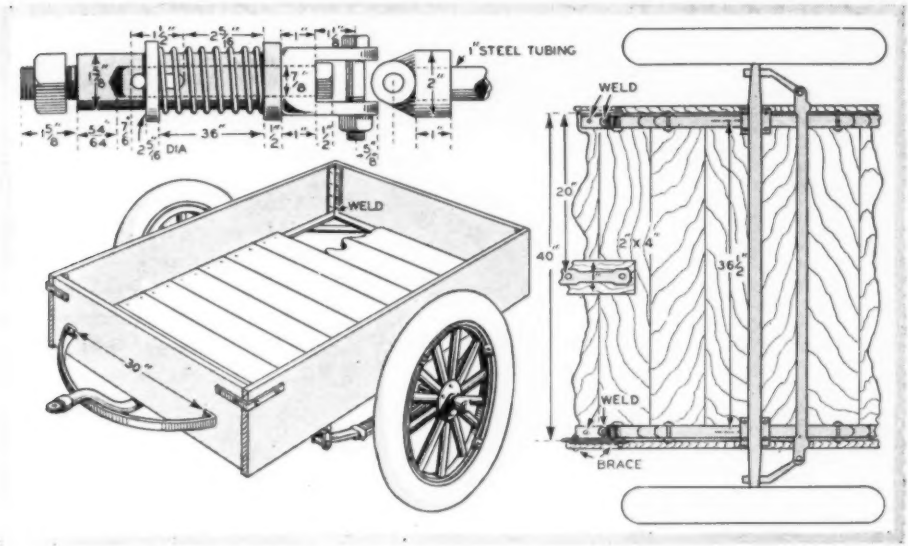
FOR thrills at water sports you can't beat aquaplaning, and here's an aquaplane for you that will give you all the excitement you could want. It's easy to construct—all you need is five ash or hickory boards, each six inches wide and five feet, six inches long. Your first job will be to bend the front ends of these boards. This is accomplished by soaking them all night in water, and then steaming them in rags soaked with water. The rag-covered board is held in the fire till all moisture is absorbed, and then they are clamped on a table in the manner demonstrated in the above drawings. When this task is completed, the planks should be fastened together with brass screw fasteners, as illustrated above, and two holes bored in the end pieces for the towing bridle. Sandpapering and a coat of spar varnish completes the job, except for the attachment of a stout hand rope. The towing bridle should be made of sash cord and tied securely to prevent accidents to the daring aquaplane riders. — Douglas Melville.

Turning Signal for Heavily Loaded Trucks

THE ordinary turning signal can not be seen from behind on most trucks when loaded with bulky material, such as hay, or other farm products. To prevent accidents it is a good idea to rig up a signal made from a long bamboo rod, with a red flag attached to the end. Then when you want to turn a corner simply thrust the flag out as illustrated in the drawing at the right.—T. S. Miller.



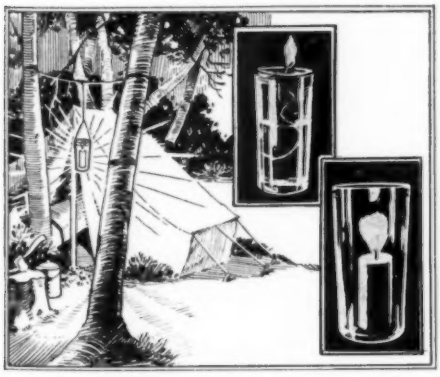
Sturdy Trailer from Ford Parts



The above drawing gives details of assembly of axle, angle iron frame, and hitch puller of trailer.

A TRAILER capable of carrying a load of camping equipment weighing 500 pounds or more may be made at a surprisingly small expense if you have access to a well stocked auto junk yard. You can obtain an old Ford front axle and front springs at a small cost. They are secured to the steel frame of the body by means of ⅜x3x3 in. steel plates, to which they are welded. The shanks of the front springs hangers should be sawed off and the hangers welded to the frame. This frame can best be made from angle iron taken from a discarded sanitary cot. The sides and bottom boards are bolted to it with lock washers, as illustrated in drawing above.

The tongue of the trailer is made from a one-inch steel rod, and secured to the bottom boards by means of a 2x4 in. steel plate. The tongue should be bent to the shape shown in the drawing above, which also gives dimensions of an efficient puller hitch. Any machine shop will turn this device out for you at a small cost. The spring takes up all road shock when going over bumps. If a good snubber is wanted, an old inner tube looped around the axle and bolted to the floor works very well.—Halvor Anderson.



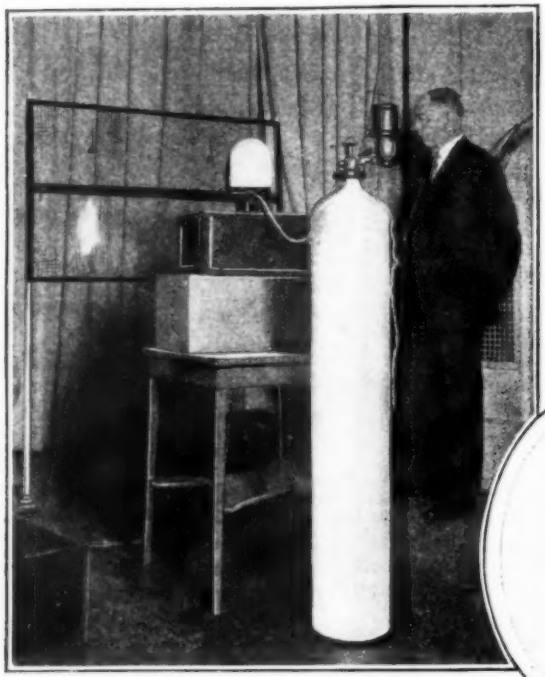
Tumblers Make Wind-proof Lights

IN a stiff wind the problem of keeping your camp light burning is often an exasperating one, but it can be easily solved by the use of an ordinary tumbler. If you are using a candle, simply set it in the bottom of the glass, as illustrated at the left. The flame will flicker and waver, but it will not go out. Another ingenious scheme is to put a small quantity of coal oil in a tumbler, lead a wick of thick cotton cord up through a hole in an inverted can cover placed over the tumbler's mouth. This trick is good for an inside light.—Dale Van Horn.

More Leisure for Man in

by **L. Warrington Chubb**
Director of Research, Westinghouse Electric & Manufacturing Co.
As told to J. EARLE MILLER

Mr. Chubb describes in this remarkable article a number of the amazing inventions recently developed which promise to free man from toil at machines, to better health, and to add greatly to the comforts of home life.



Locating and extinguishing a fire automatically is the latest task performed by the electric eye, which searches the screen, as shown here, then operates relay to direct stream of chemicals from the extinguishers.

L. Warrington Chubb.

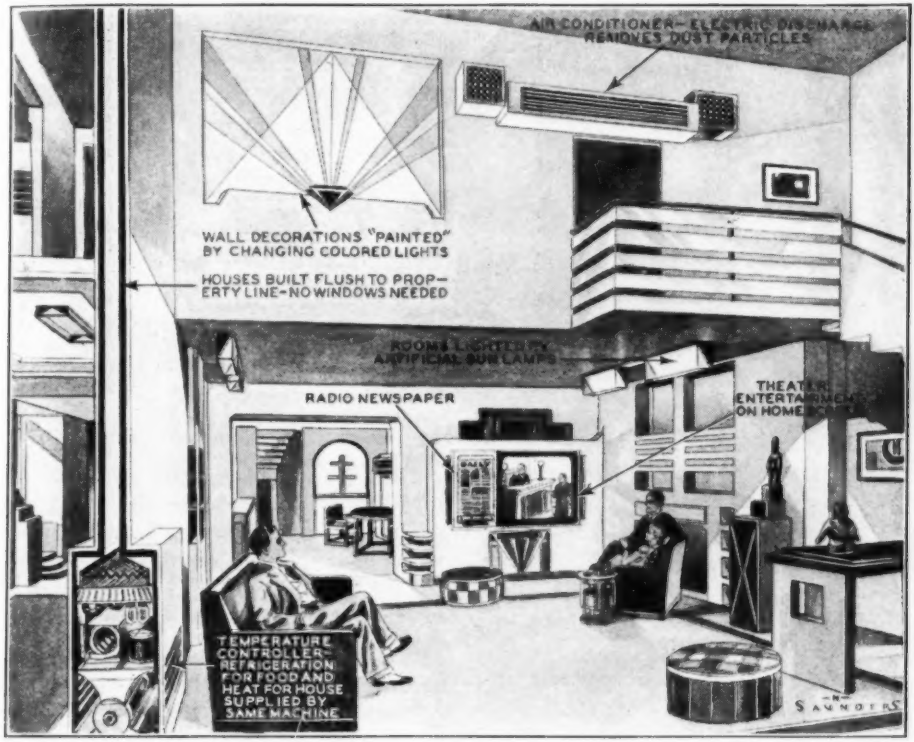
IN A ROOM down the hall an electric eye is busy at a task that human eyes and hands have always performed. Nearby an electric organ fills the building with the deep, soft notes of a cathedral instrument. Across the way a facsimile machine receives and dispatches exact copies of written or printed pages, a cathode tube flickers with the moving picture of electricity in transit, and a beam of polarized light passing through a piece of celluloid is telling its master that railroad rails are being made with too much steel near their base and not enough just beneath the flange on which the car wheels glide.

Those widely different activities, together with a host of others like them, are the first light beams marking the dawn of the automatic age, when electrons will be harnessed to perform many of the tiresome, laborious tasks that human brawn has been mobilized to do in the past.

The past fifty years or so have been known as the machine age, but now comes the automatic era to emancipate man from the machine. The old bugaboo, that labor will starve unless it can work at back-breaking tasks, immediately arises. But the history of machine development has shown that when science frees one man from wearisome labor it creates new fields to utilize his released talents. And without modern machinery men would still be working 12 and 14 hours a day for a mere pittance, earning scarcely enough to clothe and feed a family, and having only bare necessities of life.

The field of probabilities in the new era opened by the harnessing of the electron are as vast as electricity itself. One of the chief problems we are considering at the Westing-

the AUTOMATIC AGE


AIR CONDITIONER—ELECTRIC DISCHARGE REMOVES DUST PARTICLES
WALL DECORATIONS "PAINTED" BY CHANGING COLORED LIGHTS
HOUSES BUILT FLUSH TO PROPERTY LINE—NO WINDOWS NEEDED
ROOMS LIGHTED BY ARTIFICIAL SUN LAMPS
RADIO NEWSPAPER
THEATER ENTERTAINMENT ON HOME SCREEN
TEMPERATURE CONTROLLER—REFRIGERATION FOR FOOD AND HEAT FOR HOUSE SUPPLIED BY SAME MACHINE
SAUNDERS

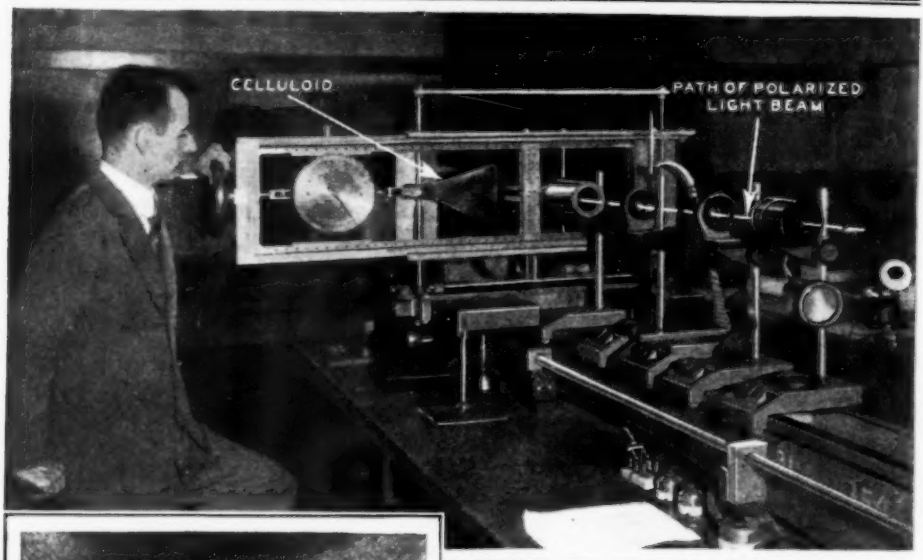
This artist's drawing illustrates the logical development of the typical home of the future. Health-giving artificial sun lamps will eliminate windows, while an electric machine will warm rooms with heat extracted from air, and also purify the atmosphere and furnish proper humidity in the same process.

house research laboratories is the home of the future. It isn't enough that the electrical industry should provide a welded steel framework and fill it with light and with labor saving appliances. The scientifically created home of the future should be heated in winter and cooled in summer by electricity; it should have washed air of the proper degree of humidity; it should be lighted with the proper mixture of health giving ultraviolet rays.

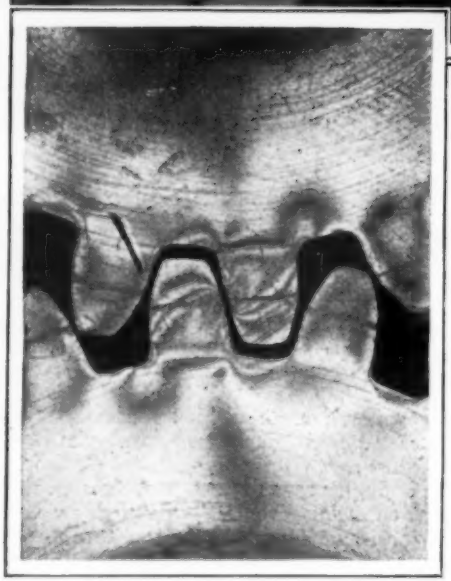
Such a home can be built to the property line, eliminating both windows and light and air shafts, and its inside rooms, lighted by artificial sun lamps, will be more healthful than the outside rooms of the present. Some day we may combine the heating plant and the refrigerator, and the operation of making ice will heat the house. Heat can be extracted from air by compressing it, and the dust removed by an electrical discharge. This discharge will also give washed air without the disadvantages of applying water, as it will be extracting the moisture to obtain the proper humidity. The heat extracted from the air can be applied to a water heating apparatus, or even stored for future use.

Our facsimile transmitter opens a new field for the home of the future, which not only can have radio entertainment and television, but also a radio newspaper. Such a receiver is quite simple, literally a development of the old-fashioned electric pencil, or stylus, writing on a sheet of paper dipped in iron oxide—a device which many young experimenters in years past have built.

This Photo-elasticity Machine Reveals Points of Stress in Machine Parts



The machine which tests celluloid models to determine strain upon rails, cog wheels, etc., by photo-elasticity method. Polarized light beam from crystals passing through model under test appear on screen in one of the colors of the spectrum, changing as stress changes.

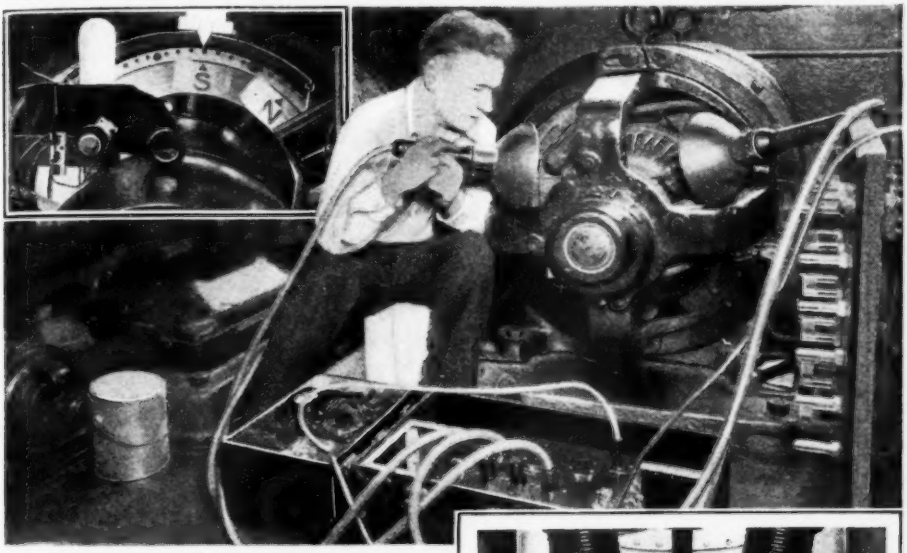


Lines of strain in celluloid model of cog wheel revealed by polarized light, as shown here, enable engineers to locate points of maximum stress.

In the facsimile receiver a roll of chemically prepared paper passes beneath a revolving cylinder which establishes contacts corresponding to the transmitted signals. The moving paper requires no development, and can be torn off at intervals, just as the paper is removed from the wide roll news tickers now used in handling market reports.

Another field of future research to which serious attention is being devoted is the relation of electricity to physical welfare. The same energy which lights your home, does the cooking, washing and ironing, brings messages over wires and entertainment through the air, plays an important part in your health. In fact the medical world is coming to realize that sickness is in some way involved in electrical changes in the tissues of your body, and that medication may only be a means of restoring the proper potential. When you reduce the wavelength of radio signals to extremely short waves, only a meter or two in length, which means correspondingly high frequency vibrations, they impart heat or a species of fever to those working in the same room. In these extremely short waves there is a new field of therapy which remains to be explored and understood.

The ultra-violet rays, just beyond the visual band of the spectrum, are being developed as another aid to health. The time

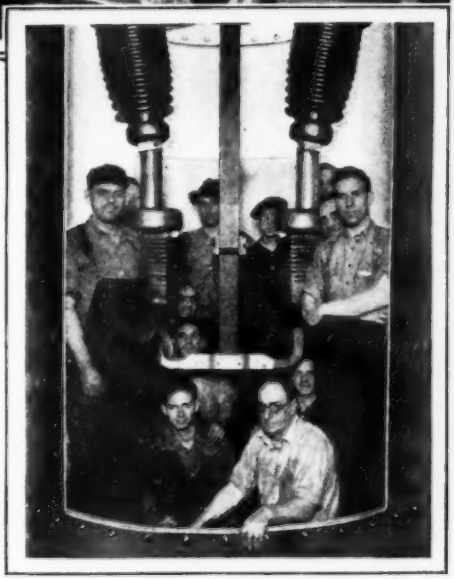


Providing neon flashes lasting only one three-millionth of a second, and occurring at intervals controlled by operator, this stroboglow makes revolving motor armature appear to stand still, as shown in inset, so that operator can study vibration, etc.

is not far distant when the light in our homes will be properly tempered with these health giving rays to provide much better living conditions than can be had even out-of-doors in our large cities, where a great portion of the health-giving rays of the sun never penetrate the overhanging curtain of smoke and dust.

Electricity, as science is coming to realize, is very nearly everything. All the elements—ninety-two—provided for in our atomic table, can be reduced, in theory, to a single element, for they differ, seemingly, only in the number of electrons in their atom. And then, if the final atoms of the ultimate element were broken down they would resolve, not into mass or matter, but into electrons, which are simply electricity, positive and negative.

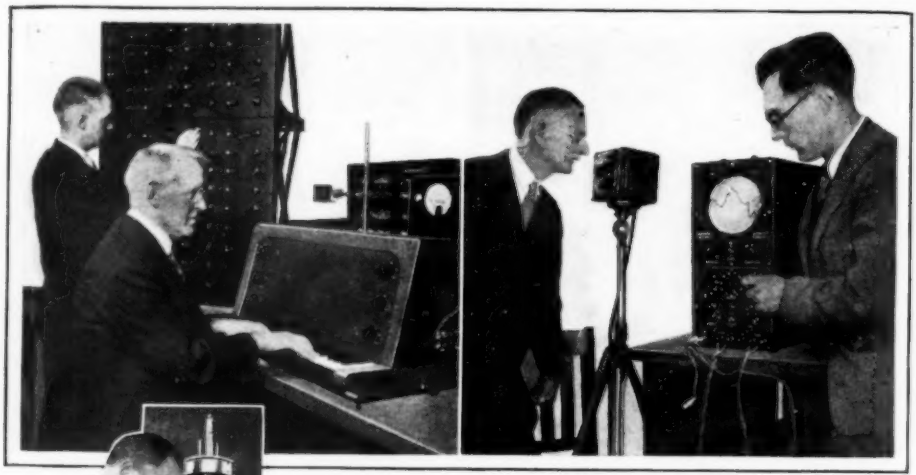
We can't do that, and we can't see the electron, yet we are putting him to work. And in electronics there opens a vast new field of labor-emancipating, automatic control. Take, for example, one of the simple problems our electric eye—which is essentially not much different from a television



The new giant circuit breaker for super power lines which trips in split second, then closes circuit again to see if the trouble has cleared up.

transmitter — is solving today in industry. In a yeast factory one of the most tiresome operations was the inspection of each cake as it left the wrapping and labeling machine to make sure that the maker's label had been stuck on the foil wrapper.

Electricity Creates Fever in Body With Short Waves to Cure Disease



Left, above—This recently developed electric organ eliminates ponderous pipes of wind organ and sounds both high and low notes with equal volume. Right—The "Movie-Talkie" device which reproduces voice, indicated by jagged line, on screen of a new cathode ray tube.

Here is the latest in vacuum tubes—the new Westinghouse super-power tube which will make possible trans-Atlantic and nation-wide broadcasting.

We put an electric eye on the job—a photo-electric cell which can detect the difference between plain foil and foil covered with the printed label. The cakes pass under it on a moving belt, and, so long as the label is in place, nothing happens, but when one comes along without its label the electric current from the eye trips a magnetic circuit and a metal arm shoves the defective cake aside.

That's an intelligent machine, and a small one. In point of size there is a vast gulf between it and our new giant circuit breaker for a super-power line, a machine so enormous that a dozen men can find room within its shell. Yet in its way this larger machine is just as intelligent, for it guards millions of dollars worth of electrical equipment, protecting it from dangers with which no human being could cope. Let lightning strike the transmission wires, or a short circuit occur, and the giant breaker will trip in such a minute fraction of a second that no damage can occur. And then this intelligent machine will wait a bit, then cautiously close the circuit to see if the trouble has been cleared; and if it hasn't, it will open again—an act of real mechanical intelligence.

Such machines can be placed anywhere, for they eliminate the necessity of a human attendant to supervise them. Their development may soon place the power industry in the hands of these automatons. In recent years there has been a tendency to eliminate expensive power plant buildings and move the equipment out of doors. The natural result will be automatic watchmen built into the machinery, ready to tell the supervisor

(Continued on page 196)

PLANE TALK

Edited by H. H. ARNOLD

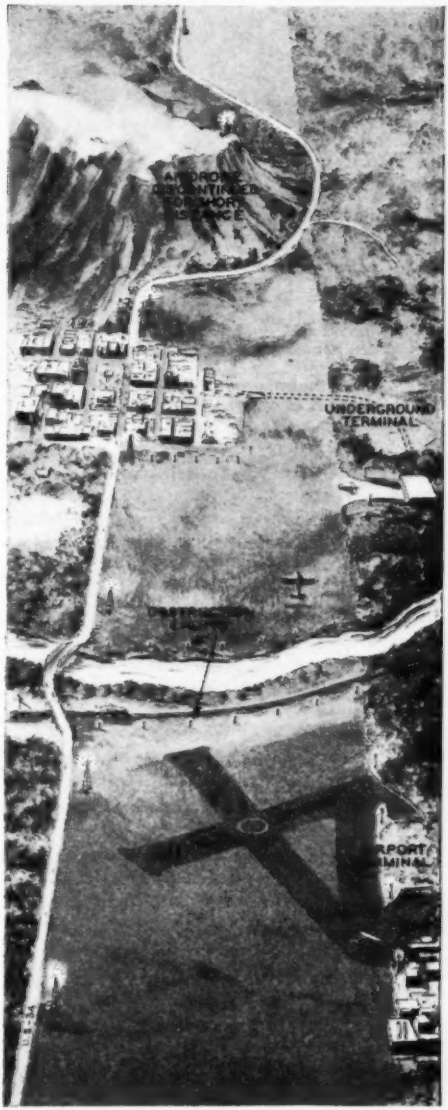
H. H. Arnold, one of the first military aviators and Assistant Director of Military Aeronautics during the World War, each month discusses the progress of aviation from a background of experience as old as military aviation itself.

All Weather Airways

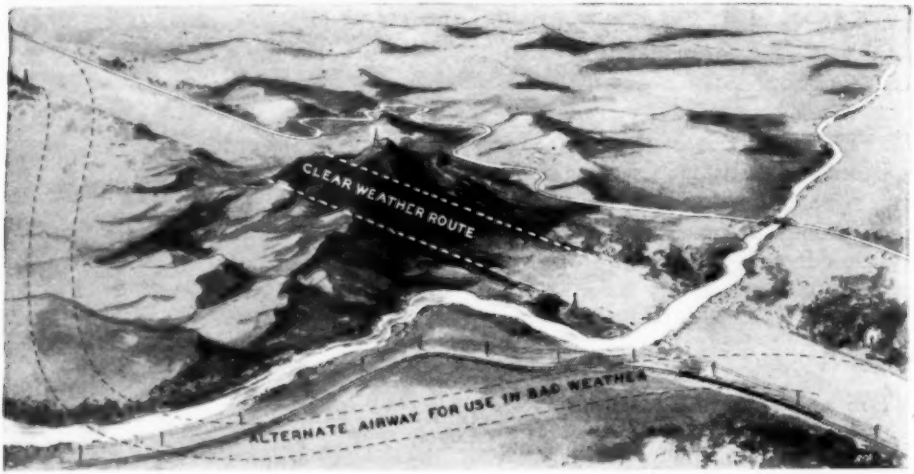
IT IS a well recognized fact that in order to be a commercial success aircraft must be able to operate in any and all kinds of weather. Now that the novelty of flying has about worn off, there are more and more empty seats on the commercial air liners. Too often the would-be passenger is told, after going to much inconvenience to get to an airdrome before daylight, that the plane will not depart until later on account of bad weather ahead. 'Tis true that present day air operations are much more reliable and the planes after starting, get through oftener on account of the weather reports from points down the line but the passenger is interested in getting to his destination. A few such delays and the would-be traveler of the air liner will take more time for his trip than if he had taken a train in the first place.

Everyone connected with aircraft backs off from comparing the airplane with the automobile but for commercial operations it must be compared not only with the auto but also with the railroad. At the present time it takes a wash-out on the line, a blizzard like the ones which we used to have in the old days or mechanical trouble to keep a train or automobile from keeping its schedule.

To make such perfect service possible the railroad companies spent millions of dollars on rights of way and road beds. Millions more were spent by cities, counties, states and the national government to change mud holes, sand, clay and gumbo into paved highways for automobiles. The result is that the autos and trains keep on moving in spite of fog, heavy rain, clouds, snow or murky weather for there is no danger of getting



The continuous airdrome system which will some day be installed along the most important airways, making forced landings safe at any point.



Where topography prevents continuing the airdrome in a straight line, the airway will go around the obstruction in the same manner as roads and railways are laid out at present. Airplanes will fly the shortest route in clear weather, but will take the alternate route, as shown, when visibility is poor.

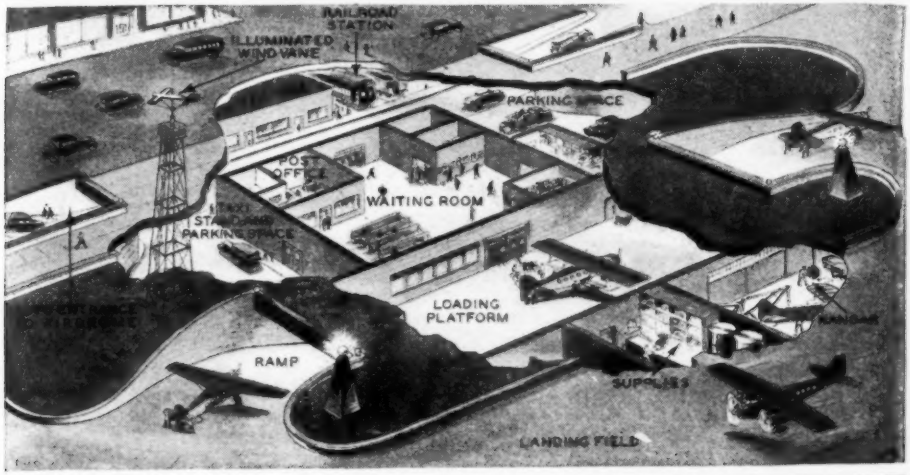
mired, running into obstacles or getting off the main route.

While the airplane travels in a different medium, it is affected by the same bad weather. When the clouds cover the high ground, the fog is down on the ground, the falling rain or snow limits the vision ahead unreasonably, the plane either does not start or lands as soon as possible. How different would air travel be if the pilot knew that no matter where he was on the airway he could make a safe landing. When the pilot has that assurance and the passengers find that the planes start on schedule in spite of bad weather, there will be fewer empty seats on the air liners.

There are comparatively few real important airways in the United States. There are few airplanes today which require more than 1000 feet for landing and taking off. Accordingly a strip of land 2000 feet wide along the airways would provide a continuous landing field and even in the worst weather the pilot could feel his way through with comparative safety. The cost of such a strip would undoubtedly be great but the same system could be used as was in road construction, by establishing strips at intervals which some forty or fifty years hence would be connected when the project was completed. The taxes already collected on airplane gasoline would have gone a long way toward getting such a project started.

It would be advisable to have the airways follow trans-continental railroads or highways and our country lends itself to this very nicely. The illustration shows how the airway might start out along a highway, take the course of a river and then follow a railroad, depending upon which came closest to the direct course. Alternate routes for the planes would have to be laid out for detouring around high ground which are known to be covered with clouds or fog in bad weather. While the pilot might be able to follow the airways safely across such mountains, in the fog it is always better to play safe with a load of passengers.

Our airways are now well marked by beacons. In some cases the beacons are radio and in other lights. In any event they are so spaced that the airman is always within sight or hearing of a beacon. The lights may be from ten to twenty miles apart depending upon the character of the terrain. The all through airway would have the same system of beacons. In addition there would be small boundary lights marking the boundaries of the continuous airdrome. These boundary lights would be of low candle power and placed just close enough to tell the pilot where the cleared area was located. All



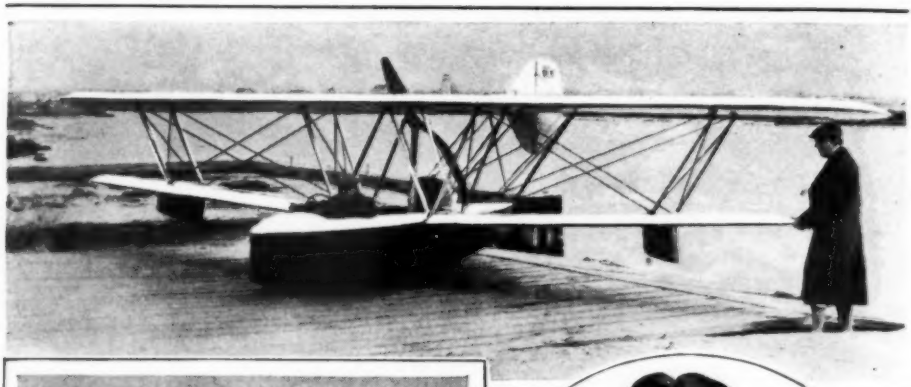
Air terminals may be built underground with ramps leading from the airport down to the terminal. Passenger accommodations, post office, hangar and repair shops, will thus be protected from unfavorable weather and planes loaded from under cover. The terminal so placed will not be an obstacle to flying.

obstacles crossing the airway would have obstacle lights. These different lights would be of different colors and intensity as they are now. The telephone, telegraph and power lines would be located some distance from the landing area; far enough so that a plane coming in to land cross ways of the area would not hit them.

This airway strip, of course, would not need the care and maintenance of the terminal airports. It would be enough to clear the space of trees and buildings, mark all obstructions, and perhaps do a certain amount of leveling when funds permitted. A good pilot can set a plane down in any fairly level field if it is large enough: therefore, removing fences, buildings and trees would be all the preparation needed in the mid-western states.

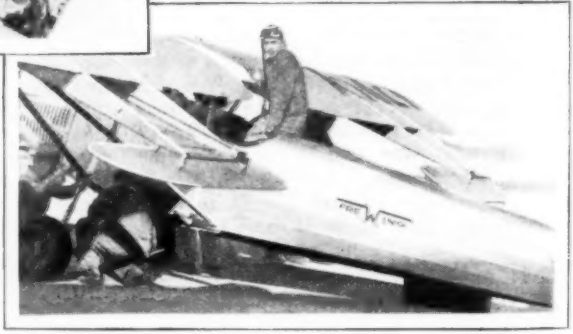
During the World War the Germans bombed the British airdromes in the vicinity of Dunkirk so often that it was impossible to keep the hangars in any kind of condition. Accordingly the British built them underground. Regardless of the size of our modern airdromes the hangars always cramp the style of the airmen at some time or other. Underground air terminals would have many advantages. Such an installation insures that regardless of weather conditions, the planes can be loaded with no inconvenience and with passengers and crews always being under cover. The installation can include offices for the terminal personnel, passenger waiting room, ticket offices, hangar and shop for repairs and store rooms. There is no doubt but that such a terminal would eliminate all obstructions to the airmen. The entrance to the ramps for going down to the terminal would be marked with distinctive colored lights. Passenger cars and taxis could have parking space near the terminal and also have their own ramp for going to and coming from the street level. The all through continuous landing field would undoubtedly insure much better and much more reliable service than the present air lines can give today. It will certainly be expensive but no more so than the paved roads which we have extended to every city and town in the country. The taxes which we collect on airplane gasoline would provide means for making a start. At first the strips could be made but 1000 feet wide and cleared at intervals along the most important airways. As the money became available the intervals could be shortened and sections laid out on other airways. However, regardless of expense some such system will be installed so that the traveling public can secure the full benefit of the speed which is available when airplane transportation is used.

Late Progress of Aviation Is Shown in These Pictures



The photographs at the top and immediately above show a seaplane built by the Robertson Brothers, of Alameda, California, which is powered with a 32 horsepower outboard motor. The flying boat has a wing spread of 28 feet, a top speed of 75 miles an hour, and a landing speed of 36 miles an hour. In tests the boat reached an altitude of 8,000 feet and consumed only three gallons of gas an hour. Fully loaded it weighs 700 pounds. This boat will be on a production basis shortly. It is expected to win popularity among outdoor sportsmen.

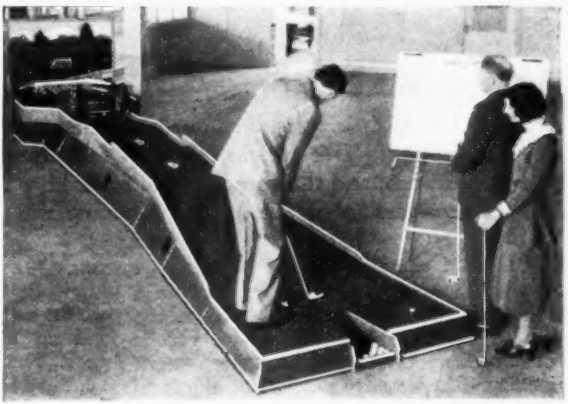
This one point parachute harness release will permit the wearer to disengage the 'chute immediately upon landing in a high wind.



The inventor, G. W. Cornelius, claims that this plane cannot be crashed. Note the novel automatic controls for the wings.

"Skillynks" Combines Midget Golf and Target Practice

THERE seems to be no end to the forms these miniature golf games will take. Not content to confine the dwarfed replica of the ancient and honorable pastime within the narrow boundaries of a vacant lot or store, a Wisconsin firm is now producing a portable golf game which may be set up in any space which can be stretched to 5 by 24 feet, thus making it possible to play golf on the street car or fishing boat. All that remains now is for someone to produce a vest pocket set. The device shown here resembles target shooting, with the cup as the bull's-eye. As suggested by the name, it is a game of skill.



In Skillynks, shown above, one shot is permitted with each ball, the shots being scored according to their nearness to the hole.

A Simple Trap for Tree Pests

No bait is required with this simple pest trap.

MANY kinds of shade tree pests can be caught with a simple burlap band tied around the tree with a piece of string and folded down so as to form a shelter. Caterpillars crawling up the tree trunk seek the shade of the burlap shelter.

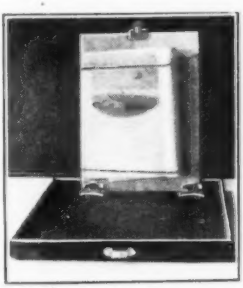
End Hard Times by Invention

ONE way to end the present business slump, it was urged by the British economist, Mr. J. M. Keynes, before the Royal Institution of London, would be for someone to make a new and revolutionary invention like the steam engine.

The chief thing that continues a business slump is that there is no incentive for investment. The deadlock would be broken and the present world-wide slump would be ended, Mr. Keynes believes, if some scientist would only make a great invention of importance to industry, like a practicable solar engine or an atonic engine. That would stimulate investment at once and would revive industry everywhere.

A Quickly-Made Copy Board

THE user of a portable typewriter will find that by placing a piece of pasteboard in the detachable base of the machine, a handy copy board may be made. The paper from which the copy is being taken may be held by rubber bands.



Copy is held against the board with rubber bands.

A FORD-Powered

by B. H. PIETENPOL

Here is the third instalment of the great Pietenpol "How-to-Build." This article takes up the motor mount, struts and fittings, and the complete tail assembly. Next month the aero conversion of the Model A motor will complete this series.

YOU M-M embryo airplane constructors who have followed the complete series on the construction of this little ship in the preceding two chapters which have run in MODERN MECHANICS AND INVENTIONS will remember that we have touched on the fuselage construction, and on the wing construction.

Now it is time to go ahead with the "*petits details*," as we used to murmur in France. Things like ailerons, control surfaces and such things really must be used on an airplane if you want to navigate her.

Let's start off with a flare back on the undercarriage. One or two fellows have asked for a word on that made up in steel. The drawings were presented last month, and I thought them so complete as to need no explaining, but it seems that a steel undercarriage — sometimes termed "trucks" by unknowing writers of pulp paper fiction— would be much desired by the all-steel fans.

I say don't go in for steel tube landing gear. The plans as shown are for a gear similar to that of the old Jenny. Of course, you could clean it up some, and might possibly gain a few feet per mile bettered performance, but inasmuch as the Jenny gear was the creme de la creme of roughneck airplane bottoms, serving for fifteen years the needs of all crash landings of cub pilots, it has proven itself times beyond count. I didn't want to go into steel tube for the landing gear after experience had proven the one I designed, and which was shown last chapter, was ample, adequate and above all, cheap.

The question of where to draw the line at the exposition of directions for the building of a ship like this is difficult to settle. Some

How the Pietenpol Air Camper looks on the ground ready for "contact." The ship is here shown alongside a six-footer; its size is readily appreciated. This job looks every inch a real airplane.

2-Seater Monoplane

Don Finke at 3,000 feet and still climbing strongly. The inherent stability of these ships has been apparent in hundreds of hours of air use—there are no "bugs" in either the engine or the plane.

want just a lot of dimensions repeated in the text that are a thousand times more eloquent on the drawings, and some would even have you tell them how to hold the hammer. And there are a few who, after having been told how to hold a hammer in the building of a ship, would ask you how many swipes to clout the nails on the head. So I am adopting the course of telling you the hidden quantities in the design, outlining the major methods of attack in building her, and am not concerning myself with questions like what speed would a Townend ring give her, and couldn't we put a steel undercarriage on her. I say go ahead and build her. The methods will largely furnish themselves according to your knowledge and the equipment you have at hand. All vital dimensions are on the set of plans. The design is remarkably complete. And we won't monkey with steel tube undercarriages or other flarebacks. If you want to experiment with her —it's yer own option. I canna prescribe.

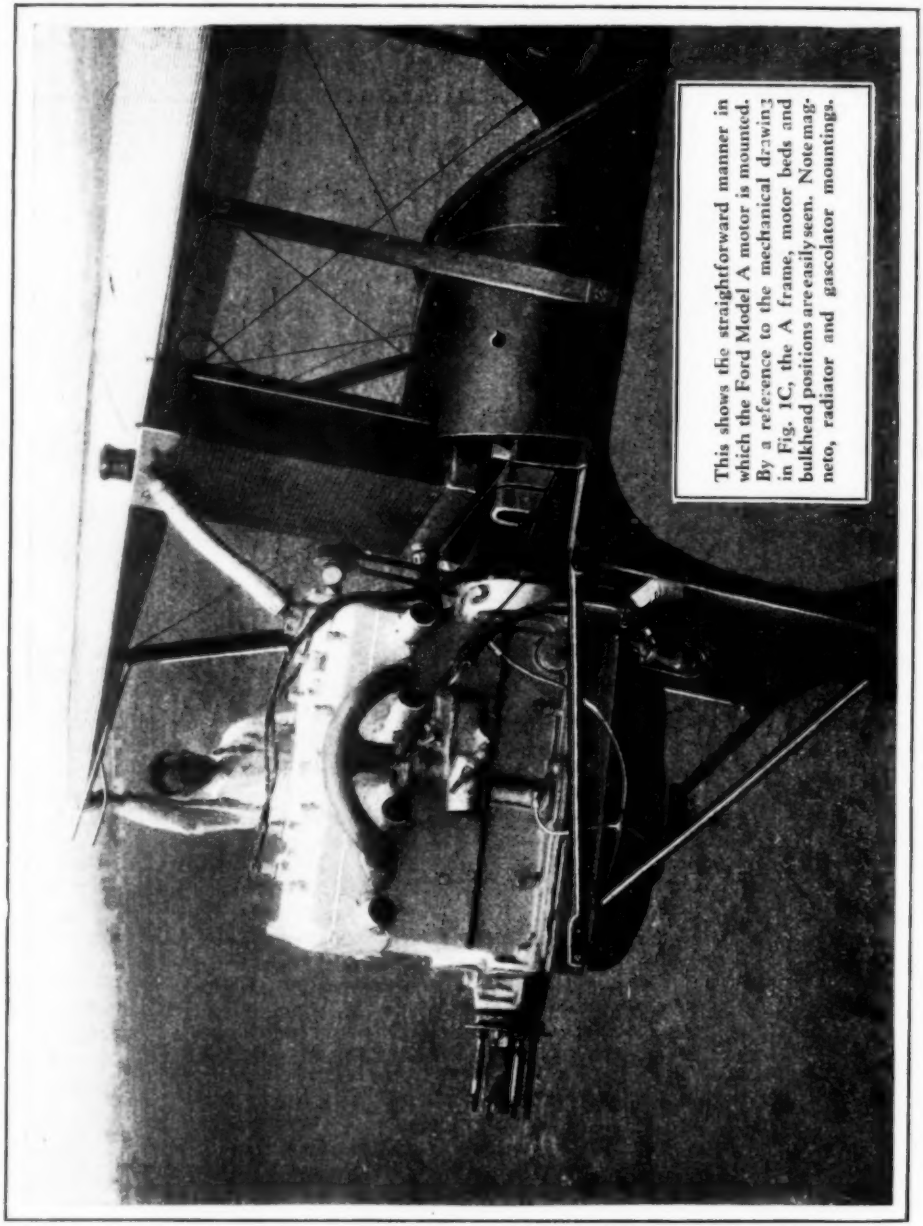
Let's look at the motor mount. That is one thing on which I could write volumes. And the mount I have designed after many a flunk in the school of hard knocks, is the one shown in the drawings in Fig. 1C.

Simple it is, and ties right in to the nose of the fuselage like mucilage on a piece of blotting paper. The whole mount suggests itself to me as being less an attachment than a part of the ship itself.

Two pieces of white ash, one of them 1" by 2¼" and the other 2" by 2¼" (to allow for the accommodation of the oil pump on the left side of the motor sump) are rested directly on the beam anchoring the fuselage bulkhead. One ¼" n.s. bolt, with washers, of course, is run through a drilled hole on the 1" piece. Two are used on the 2" piece. Virtually, then, the engine bearers amount to 1" net thickness, and are supported at their outer ends by an A frame

THE PIETENPOL BLUEPRINTS

A complete set of large size shop blueprints of the Pietenpol Air Camper may be obtained for $7.50 from Modern Mechanics and Inventions, 529 S. 7th Street, Minneapolis, Minn. These plans show construction of both wood and welded steel fuselage.

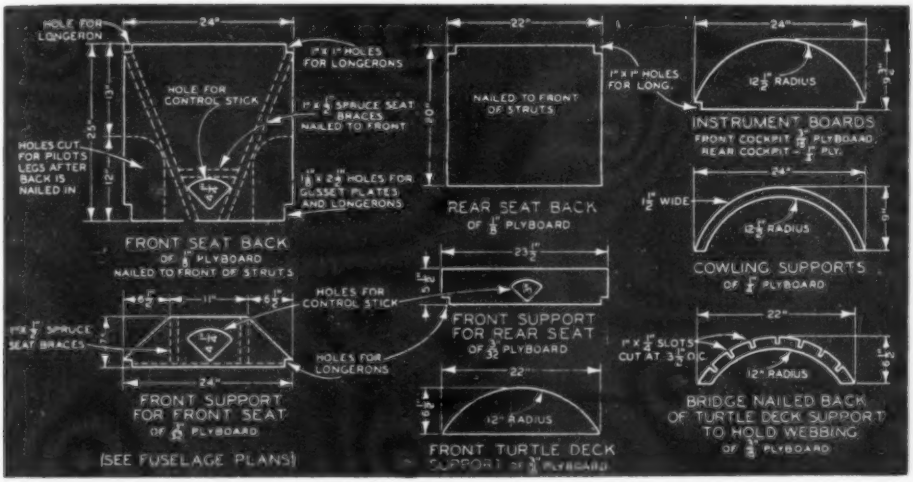


This shows the straightforward manner in which the Ford Model A motor is mounted. By a reference to the mechanical drawing in Fig. 1C, the A frame, motor beds and bulkhead positions are easily seen. Note magneto, radiator and gascolator mountings.

of 7/8"—20 tube. This tube is heavy enough for engines up to sixty or seventy horsepower. In fact, we built one of the ships powered with a five-cylinder Velie of 60 h. p. and the ding-busted little wagon flew rings around itself. We never had a moment's trouble.

You note that the bolts on the ends of the A frames are sunk so that the bed of the

The Seats Are Simple — So Are the Turtleback Fairings Shown Here


HOLE FOR LONGERON
24"
1" X 1" HOLES FOR LONGERONS
HOLE FOR CONTROL STICK
1" X 3/8" SPRUCE SEAT BRACES NAILED TO FRONT
HOLES CUT FOR PILOTS LEGS AFTER BACK IS NAILED IN
1 1/8" X 2 1/8" HOLES FOR GUSSET PLATES AND LONGERONS
FRONT SEAT BACK OF 1/8" PLYBOARD NAILED TO FRONT OF STRUTS
22"
NAILED TO FRONT OF STRUTS
REAR SEAT BACK OF 1/8" PLYBOARD
1" X 1" HOLES FOR LONG.
24"
12 1/2" RADIUS
INSTRUMENT BOARDS
FRONT COCKPIT 1/8" PLYBOARD, REAR COCKPIT - 1/4" PLY.
1 1/2" WIDE
COWLING SUPPORTS OF 1/4" PLYBOARD
23 1/2"
FRONT SUPPORT FOR REAR SEAT OF 3/32" PLYBOARD
HOLES FOR CONTROL STICK
HOLES FOR LONGERONS
1" X 3/4" SPRUCE SEAT BRACES
FRONT SUPPORT FOR FRONT SEAT OF 1/8" PLYBOARD
(SEE FUSELAGE PLANS)
1" X 3/4" SLOTS CUT AT 3 1/2" O.C.
BRIDGE NAILED BACK OF TURTLE DECK SUPPORT TO HOLD WEBBING OF 1/8" PLYBOARD
12" RADIUS
FRONT TURTLE DECK SUPPORT OF 1/8" PLYBOARD

Here are the detailed dimensions for the bulkheads, the seat supports, and the turtleback fairings.

motor does not interfere with the job.

The wood bearers are set in, bolted and lined up. The A frame is made on the flat, and with a saw cut just forward of the fitting, sawn far enough through to just allow you to bend the frame into position, the forward ends are lined up.

Then the frame is taken off and the v-shaped gap filled in with a good weld. The 16 gauge reinforcing plate at the apex of the A is, of course, welded in before the frame is finally put in. It may pay you to make a jig for this job, but I dinna know. It all depends on you, as the radio singers say.

I can hear faint remonstrating voices concerning those fittings which are used to anchor the A frame. Particularly with reference to the bottom fittings where the anchorage for the A frame is jogged up so as to give a slightly eccentric moment at the point. Don't change it. I have never had a moment's trouble with this design, and the jog is necessary to allow the cowling to go over the snoot of the ship so that a clean job

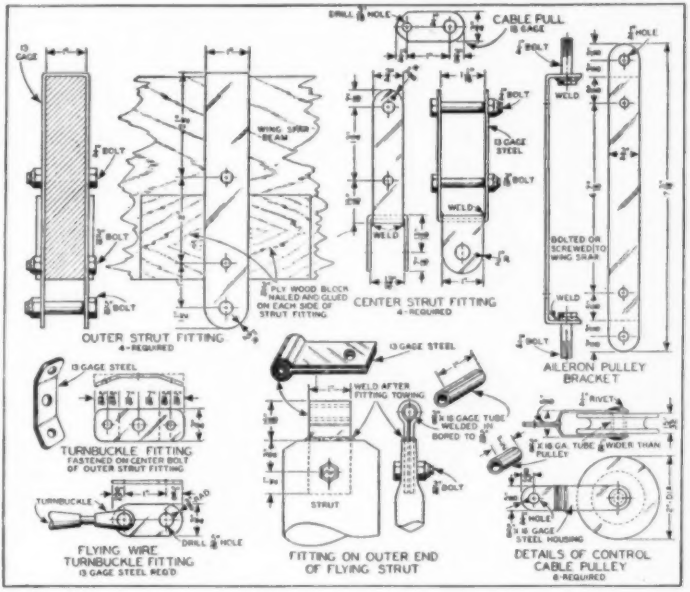

CABLE PULL
OUTER STRUT FITTING 4-REQUIRED
CENTER STRUT FITTING 4-REQUIRED
AILERON PULLEY BRACKET
TURNBUCKLE FITTING FASTENED ON CENTER BOLT OF OUTER STRUT FITTING
FLYING WIRE TURNBUCKLE FITTING 13 GAGE STEEL REQ'D
FITTING ON OUTER END OF FLYING STRUT
DETAILS OF CONTROL CABLE PULLEY 6-REQUIRED

Fig. 3C. The spar fittings for the strut attachments, as well as the pulley, turnbuckle clips, and strut ends are clearly shown in the above drawing.

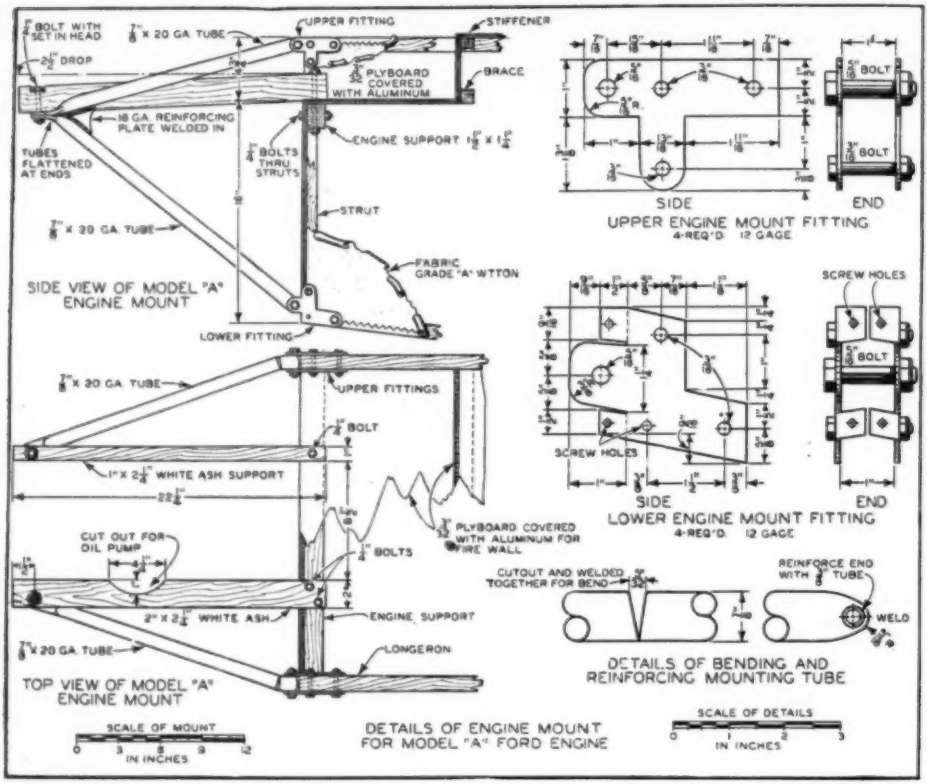


Fig. 1C. This shows details of the motor mount. Bend fittings cold. Never apply heat in bending.

of fairing results. Otherwise there will be a bib on the bottom of the cowl which will not only not be clean looking, but which will whistle like a sour owl when the ship is in the air. I never did like to fly fire sirens.

The fittings are very simple. All details are shown in the plans. And they carry back far enough, to my way of thinking, into the longeron. They carry just enough bolts to carry the load on through, and not enough to weaken the grain of the wood. In several pancakes and a mild spin which we have experienced with the ships sent out to other hands, the motor fittings never gave way in a bust up.

The patterns for the cowling are shown in figure 2C. This stuff is made of 18 and 22 gauge aluminum. The lighter gauge is indicated by the higher number, as you know. The lighter stuff is used for the front and rear strut cowlings and on the under motor cowling. There is no top cowling to the motor, and the cowling to the turtleback is made of the 18 gauge stuff. Note that there are holes drilled in it to take the very necessary padding lacing which must be used around the cockpit to keep a fellow out of serious arguments with the skin of his face and hands.

The fittings for the strut attachments and the metal work involved call for a dissertation. By a reference to Fig. 3C one may see the outer strut fittings, the center strut fittings, and the other strap work which goes into the wings.

The outer strut attachments are made of 13 gauge cold rolled steel, 1" wide and are 15" long in the unbent form.

The best way to work these into shape is to cut the blank, and then bend them to shape by gentle peening around a hardwood piece placed in a vise. Needless to say the piece must be of the same dimensions as the wing spar, as far as width is concerned, and it

More Cowl and Strut Details

should be deeper so that after the fitting is bent the drilling can be marked out and the drilling done right through the wood to get the holes squarely in juxtaposition. (That last isn't a flyin' word, but as long as I get paid by the word, I thought I'd throw it in!)

You will note that there is a ¼" bolt of nickel steel running through the center of the fitting and that the bolt on the bottom side of the spar is 3/16". Further, the bolt on the strut attachment is a 5/16" size. These are of the correct strengths to use. I have heard some criticism of this fitting by those who said that the fitting set up an eccentric moment about the neutral axis of the wing spar. That may be. But I do know that the center bolt is the proper distance from the center section strut to go right through the neutral loading point. Any slight eccentricity is of no moment, to my way of thinking, to that super-spar that goes into the wings of these little sky wagons. An elaborate strap fitting with tentacles in all directions *might* be better. Have never had an opportunity to see as in all of the flying I have done, and in all of the flying done by the others who own these ships, there has never been a suggestion of off center loading, even in crackups.

The center section strut fittings are something I am very proud of. I have never seen anything like them, and consider them clever because of the fact that the hanging feature permits of a doubling of metal at a critical point without throwing too many bolts (always a danger point in plane construction) through the wing spar.

These too should be made on a wooden form, preferably of oak or of ash, drilled, and then welded at the fillets—just at the corners, to hold the under fitting, or strut pendant, rigid.

The aileron pulley bracket in this drawing and the cable pulleys are self evident in detail and need no explanation. The wheels of the pulleys themselves may be out of old Jenny pulleys. They should be of aluminum or of lignum vitae and are adapted to the strap fitting shown in the drawing, which is designed for the ship.

Now about those struts. They are of No. 2812 standard aeronautical streamline tubing. The length of the front struts is seven feet, six and a half inches. The front struts are shorter because the angle between the fuselage and the wing fitting is less. The rear struts are an inch longer.

The streamline 1667 tubing (obtainable at any good supply house, like Johnson of

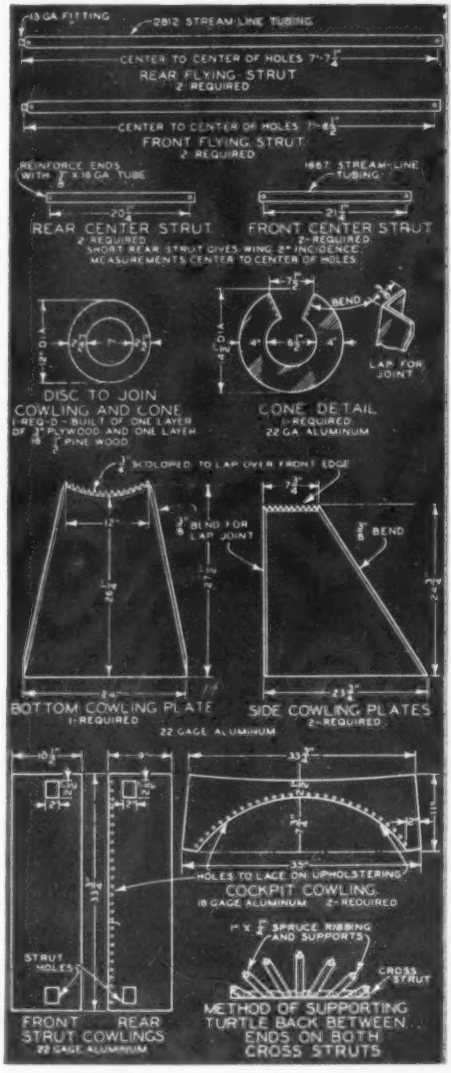


Fig. 2C. Strut dimensions and cowling details.

Dayton, O.) is used for center section struts.

The wing struts have a 13 gauge anchorage which is of slightly peculiar construction. The loop of the 13 gauge stuff is made over a 3/16" by 1" tube which is afterward bored to 5/16". The 13 gauge stuff is best bent around a drill rod of the same outside diameter as the tube. The only way to get this bending done is to do it hot, and great care

Drawing of Stabilizer, Elevator and Tail Skid Shows Simple Elements

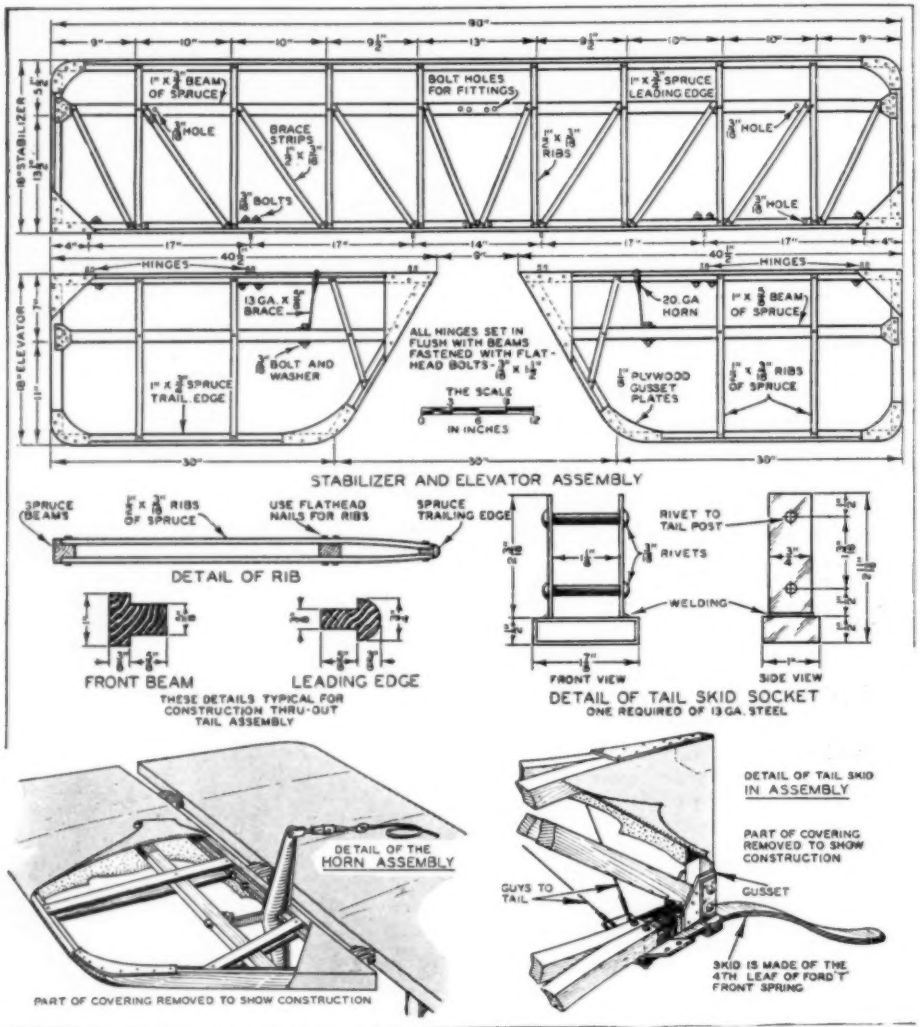

STABILIZER AND ELEVATOR ASSEMBLY
DETAIL OF RIB
FRONT BEAM
LEADING EDGE
THESE DETAILS TYPICAL FOR CONSTRUCTION THRU-OUT TAIL ASSEMBLY
DETAIL OF TAIL SKID SOCKET
ONE REQUIRED OF 13 GA. STEEL
FRONT VIEW
SIDE VIEW
DETAIL OF THE HORN ASSEMBLY
PART OF COVERING REMOVED TO SHOW CONSTRUCTION
DETAIL OF TAIL SKID IN ASSEMBLY
PART OF COVERING REMOVED TO SHOW CONSTRUCTION
GUYS TO TAIL
GUSSET
SKID IS MADE OF THE 4TH LEAF OF FORD 'T' FRONT SPRING

Fig. 4C. Horizontal stabilizer, flippers, and tail skid details are all clearly shown in this diagram.

must be exercised not to overheat the metal, not to heat it too fast, and to allow it to cool to black before quenching.

After the tube is finally in, the drilling is done. The tube really serves as a center for the drill. The strut and the fitting are clamped together in a pinch with a small stout "C" clamp while the strut is being fitted to the wing, which has in the meantime been propped to the right angle of approach and incidence, and the hole for the 3/16" n.s. bolt is drilled. When this is in the lip of the strut tube around the strap is filled in with a weld and the strut is complete.

In lining up the center section strut system, all the guy wires are run criss-cross in the usual way, of 1/8" stranded cable, solder sweated into turnbuckles. One exception: the left side has no criss-cross wiring. This must be left out if you want to be able to get your flying mate into the office up for'ard. The right side is ample to take care of its 1/3 total of the load. So on the three sides of the center section, front left and rear sides

as plainly shown in Fig. 1, in the first instalment, there are the criss-cross wires. In this figure can also be seen the criss-cross stiffening system used on the wing struts. This is the system used on the Heath Parasol, than which there is no stouter ship flying as far as structural strength goes.

A good idea of the size of this plane can be had by a glance at this figure, too. It shows how the ship is about 1/5 larger than a Parasol. Let's look at the empennage, or end spinach, next.

This as with all good airplanes and true consists of a flipper set, a rudder, and horizontal and vertical stabilizers.

These are of very rugged construction.

As with the fuselage, each piece is built flat on the bench. There is a routed section at the fore edge of the vertical stabilizer which is rabbeted as deep as the 3/16" ribs. The curved parts are built of solid white pine faced and spliced to the routed section with plywood, casein glued. The drawings on both the rudder and the vertical fin are so clear that words are superfluous. The vertical fin is anchored to the fuselage with cold rolled steel clips. The hinges are of the same materials, and the hinge pins are clevis pins, long, of about 1/8" diameter, cotter keyed against sudden departure at critical moments.

And while we are looking at the drawing showing the "end spinach" as the Hangar Gang likes to call it, let's look at the ultra simple tail skid. Nothing but the fourth leaf of a model T Ford front spring. Don't try to do the job of heating, bending and tempering yo'self, Andy, or you will sho' sho' have trouble. A plate running across the longerons inside the fuselage serves to complete the fastening system where the 5/16" bolt runs through. Or 2 5/16" bolts can be run through the longerons as the drawing detail shows in Fig. 4 C.

Figure 5 C shows the end view of the

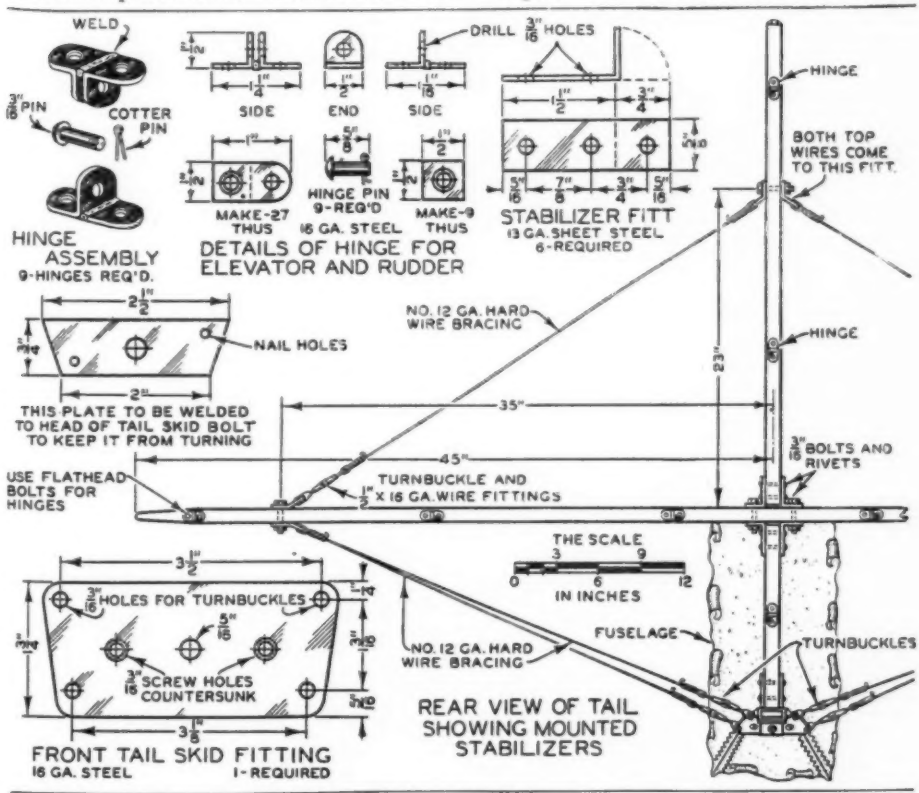


Fig. 5C. All the hinge details for the rudder and for the flippers are shown clearly. Note that clevis pins from turnbuckles are used for hinge pins. Grass does not affect takeoffs as the tail is high enough.

Another Detail Drawing of Simple Empennage

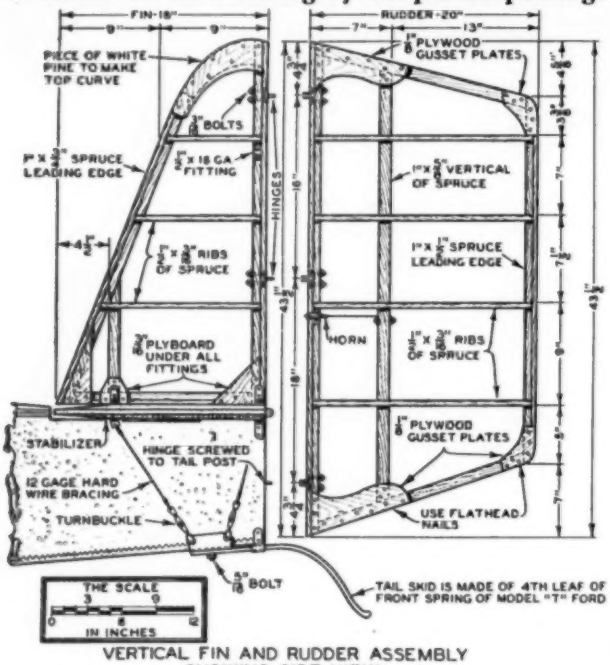


Fig. 6C. Here are the detailed complete dimensions for the vertical fin and for the rudder. Note the construction of the curved corners.

ship with the bracing system. The tail surfaces are covered with slips just as are the wings, and they are sewn and doped the same. Grade A muslin sacks of fairly close fits are made and then put on over the surfaces. Three coats of dope, well dried between, will be enough to carry the job along to the point where the drumtightness sets in, and so to the point when the ship gets her final coat of paint.

The flat plate of the horizontal stabilizer is made of rabbeted leading, side and trailing edges, with spruce cross members glued in with casein glue. Be sparing with the nails, and judicious with the use of glue, as with all other such joints, and the surface will last a long time. We have a ship which has been tethered out to the end of a hangar for a couple of seasons, and the surface is as stout as ever.

Be sure to test the surface for trueness in cross section after building, because nothing can be of more vexation than a warped stabilizer. This one is a flat plate and is not adjustable. It doesn't have to be, as the tail carries no load. It performs the "weathervane" function in the ship.

Maybe I had better give you fellows an idea of the way this little crate flies before I go into the motor details, because when I get there the space will be limited and crammed to the brim so that there will be no room for a say so on her flying qualities.

Presuming the ship to be completed, all the little details taken care of and the last coat of shiny paint dried and taut, the next thing to do is to pick out a field. And a pilot.

If you are a novice and have had less than ten hours in the air, don't try to fly any new airplane.

If you do you'll come a cropper sure as thunder, and more particularly is it apt to happen with a lightplane like this, because you must remember one thing: You have to *fly* these light ships.

The idea of a novice getting into a ship and taking her off the ground the first time in the air is boloney. And it is all the more so if he built the ship himself as he'll just have to do the job over again. Not that such ships are dangerous—far from it. Structurally they are as strong as a church. But their power is not of the soupy variety that will drag pilot and ship behind it like a shirt tail no matter what the pilot does.

They take, invariably, a little longer run. And they are, invariably, more sensitive to rudder when on the ground. Particularly those of the Parasol type. So it takes a man who knows what it is to be able to fly by wishpower and what an airplane will and won't do.

No need to teach yourself to fly in this ship. You can always take dual, right in your own ship, you know. So—

Take the ship to a good field. And be reasonably sure that it is level. Bumpy fields, until you get the hang of the Ford motor, will make the motor spit on the ground, and will confuse the pilot. Use all the field, and let the ship run until she has speed enough to fly herself off the ground if you have field enough. Never attempt to stall her off, be-

cause, while the motor has more than enough wallop to shoot two fellows into the clouds, the prop is turning at a low speed, and is not effective until a certain measure of forward travel has been gained. To stall means that you lose the benefit of this forward speed, and that the ship falls off in pulling power for quite a while. If you don't have enough to get her off without a stall, go back and use the field over again.

Once in the air, let the ship climb herself. If you have to, you can soup the stick back, and she'll jump amazingly, but you'll stretch the flying out of her quickly and she should be nosed down as soon as the lift is gone from the seat of your pants. She'll pick up fast enough. Then, on turns, you must not overbank. Try a few gentle ones first at better than 500 feet, and get wise to the pendulum action which all parasol planes have. Try out the rudder and note how sensitive and ample it is for getting you out of any pickle.

Let go her stick gingerly and see whether her fore and aft control is good. If properly loaded and balanced the ship should fly hands off. She may need a little rigging though.

In setting her down, don't try any fancy right and left hand side slipping until you get the feel of her.

So there you are, Gang. The salient points of this little sky-buster have been dwelt with at large in my text, and the very good and complete drawings have made good the balance of the directions. The whole job is really so simplified that only the super-simp will want her changed. I'll build you ships with solariums, swimming pools or anything else you want, but after all the real experimenting and planning I have done on this ship I can't see fit to change a thing. For the motor we have used, ideal for everybody, she is about as hot as you'll ever find a plane, and I'll bet that ten years from now the design will be pretty warm still. So build her as she stands. And don't ask me to change anything. The kitchenette airplanette for flying fieldettes is not yet, and I refuse to try to make the Air Camper anything but a good straightforward ship. The trick stuff is for other designs.

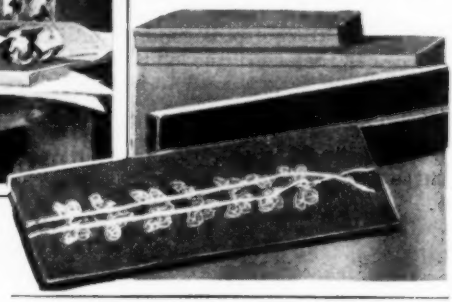
And before I sound off for the last time, let me tell you that the motor will be dealt with next time. I am running a shot of the whole business end of the plane and this will serve to tie in with the drawing in Fig. 1C, so you can savvy how the job looks out on the tarmac with her bonnet off. She's a real treat for the eyes.

Until then, adios.

At a little field at the end of nowhere, Orv Hickman pitches tent while Westy Farmer puts the kettle to boil. Gene Shank may be found at the nose of the Camper cleaning the frost off the carburetor.

Costly JEWELS *from*

Butterfly collecting is more than a hobby—it's an exceedingly profitable business. A unique jewelry shop in New York deals exclusively in articles fabricated from butterfly wings, sold for as much as $5000. It's the only one of its kind.



Oscar Fulda, proprietor of New York's unique butterfly jewelry shop, identifies a shipment of butterflies just received by comparing them with printed specimens. At right—a number of butterflies are shown fastened to a mounting board.

USUALLY mention of the word "jewelry" conjures up mental pictures of flashing diamonds, blood-red rubies, or velvety strings of pearls around the throats of beautiful women. But in New York City there is a unique jewelry shop which never deals in precious stones. Its stock in trade is expensive jewelry fabricated out of butterfly wings—lamp shades, watch cases, pendants, and other articles ornamented with insect wings splashed in gorgeous shades of color which no living artist has ever matched.

As a by-product, this unusual shop sells rare specimens of butterflies to private collectors, museums and universities. Some of these have brought as high as $500, while $25 for a single butterfly is not an uncommon purchase at this very interesting clearing-house of butterflies.

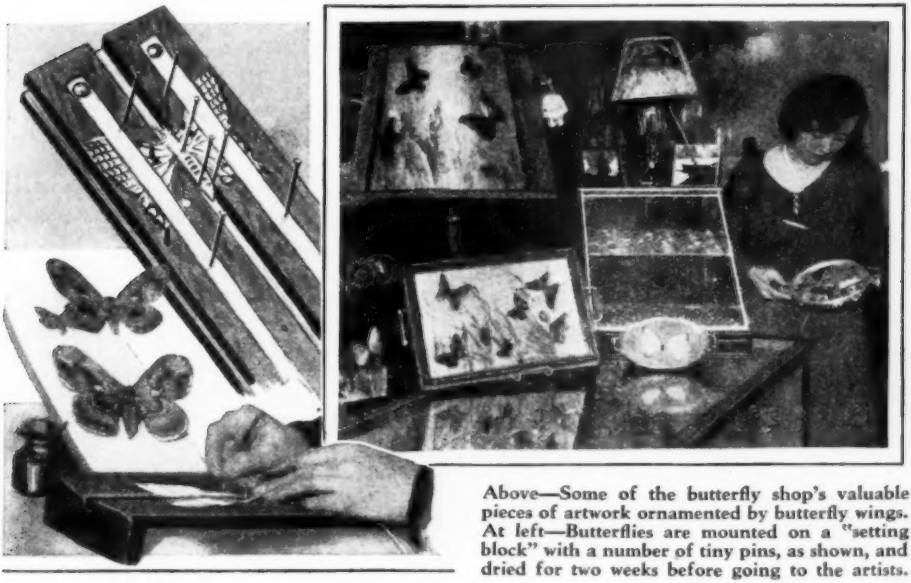
For those whose purses might be less bulging, but whose tastes turn toward this particular brand of art, one finds divers bric-a-brac in the form of vanity cases, curios, mural decorations and other trinkets, done in the butterfly manner, but within financial reach.

This shop is located on Fifth Avenue, in New York City, in the midst of the fashionable shopping district. It is the only establishment of its kind, strictly speaking, in the country. The proprietor is Oscar Fulda, eminent German scientist who for 27 years has been collecting butterflies in twenty different countries.

Some idea of the extent of the lepidoptera trade, as butterflies are scientifically classified, can be gleaned from the fact that Mr. Fulda pays an annual rent of $5,000 for a shop not much bigger than a single room in any home. It is the most valuable bit of

Butterfly Wings

by BENNETT LINCOLN



Above—Some of the butterfly shop's valuable pieces of artwork ornamented by butterfly wings. At left—Butterflies are mounted on a "setting block" with a number of tiny pins, as shown, and dried for two weeks before going to the artists.

space in the most expensive renting-district.

Hardly a day passes that some discerning society lady, or gentleman bent on bestowing a precious gift, does not enter Mr. Fulda's establishment to purchase some trinket which has been ornamented with rare butterfly wings. There are lavallieres, rings, bracelets, brooches and other baubles which have been touched up with the butterfly's satiny splendor. These jewels range in price from $50 to $5,000. Two women, specially-trained Viennese artists, attend to the embellishments after Mr. Fulda has finished with the scientific treatment of the wings.

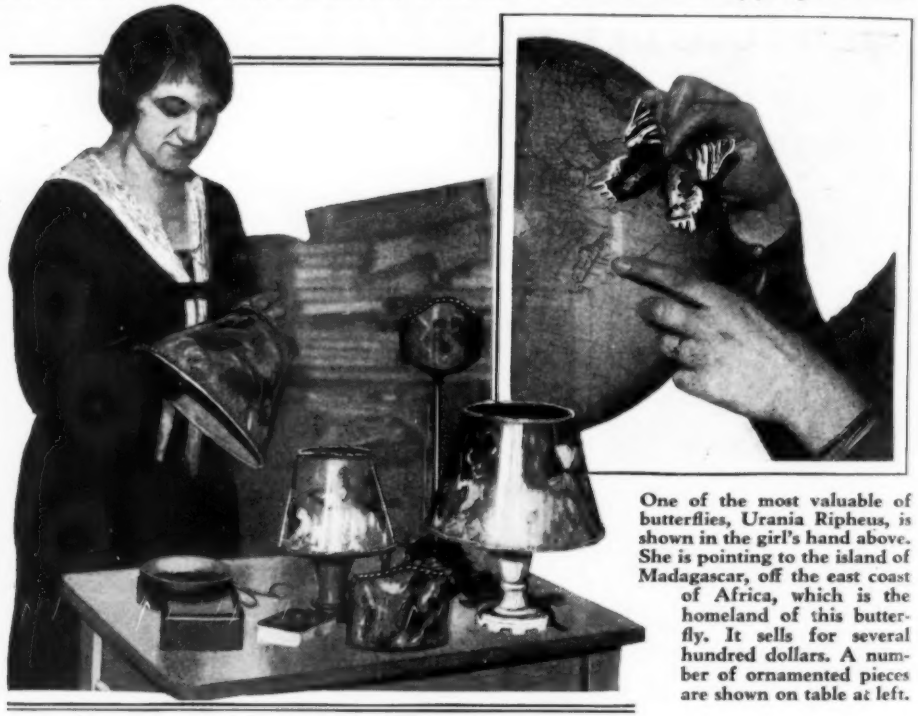
A great volume of trade is represented by the demand for trays, dishes, lamp shades, framed butterflies and other decorative novelties into which the butterflies are fashioned. The requests for these objects as well as the articles of jewelry treated with butterfly wings come from all parts of the country as well as Europe.

The types of butterflies which are turned into great commercial value at Oscar Fulda's butterfly store do not flit about the ozone in the Fifth Avenue purlieus, nor are they to be found flouncing jauntily about the garden and the fields of New England, California, or points directly north or south.

As a matter of fact these precious lepidoptera must be sought in distant regions, with rare technique and sometimes at an enormous cost. Though the collecting of butterflies is a pastime which was enjoyed in remote antiquity, many centuries ago, the tricks in trapping them have not altered very noticeably with the flight of the ages.

"Certain fundamental facts are known to the student of natural history," declared Mr. Fulda. "Those observations were known to

From the Far Ends of the Earth, Collectors Send in Butterfly Specimens



One of the most valuable of butterflies, Urania Ripheus, is shown in the girl's hand above. She is pointing to the island of Madagascar, off the east coast of Africa, which is the homeland of this butterfly. It sells for several hundred dollars. A number of ornamented pieces are shown on table at left.

the Persians and the Egyptians of ancient times and are still part of our guiding lore in the capture of the elusive and precious lepidoptera.

"Three months of every year I leave my Fifth Avenue shop and laboratory and I travel to India or New Guinea, Brazil, Madagascar, New Mexico, Siam or China. It is then that I go in pursuit of the valuable species of butterflies, made costly not only by their rarity but also by their magnificent colors—colors which I have never seen reproduced by any mortal artist on canvas.

"It is in Madagascar, an island in the Indian Ocean, off the east coast of Africa, that I search for the most beautiful and most valuable insect in the world. This butterfly is known as the Urania Ripheus. I have never seen such an exquisite combination of colors in either nature's or man's handiwork. One of these butterflies occasionally brings several hundred dollars.

"Some persons might wonder why the artistic ornamentation of a particular piece of jewelry with butterfly wings should enhance its value so many times over. Aside from the superior art work which it portrays, there is still another item to be taken into consideration. That is the human relations end of it.

"For instance, let us assume that butterflies are, or once were, your particular hobby. Science tells us that every man and woman is smitten with some hobby or other. More hobbies and less crime might make this a happier cosmos to live in. Anyway, supposing you are a lover of butterflies, and you are acquainted with the gorgeous Brahmae Wallicki specie which is native to Assam, India, and you want that type to decorate the face or back of your watch. You can readily see that, if you have the price, you are quite willing to pay it. There are hundreds of persons like that.

"When I saunter off on excursions to these distant lands, I usually am in possession of a number of orders from museums and private collectors as well as a list of butterfly stock needed for my own store. I have often found myself commissioned by a museum, either American or European, or even a university, for that matter, to get a certain

Bonfires and High Towers Are Used in Capturing Elusive Butterflies

The owl butterfly, shown in the circle, gets its name from the peculiar pattern of its wings. Look at the lower wings from a distance, and the resemblance to an owl is strikingly evident. Collectors mount their specimens like those exhibited by the woman above. Experts appraise a butterfly's beauty by its wing pattern.

specimen and find that days and days of vigorous search prove futile.

"Hunting butterflies is not like stalking elephants or lions. The habitats of butterflies are concealed and not apparent. There are no tracks to take up. Their trails are subtle and imperceptible. However, I do not find myself completely stranded when I reach a certain region, for natural historians before me have noted down the particular butterfly inhabitants of the locale. In my close to three decades of wandering in these far-away lands I have also discovered a number of formerly unknown specimens.

"My equipment on these expeditions for the most part consists of a net attached to a hoop about a foot in diameter. To this hoop a handle is attached. This is my 'gun and ammunition'. But the rare butterflies and moths do not travel in herds and clusters. They must be ferreted out and run down to their lairs.

"In some vicinities I have gone into fields and in wooded areas and by the deft use of my net I have been able to capture a big quarry of butterflies of the precious genus. These catches have been in big numbers often. At other times I have spent days trying to snare a single one.

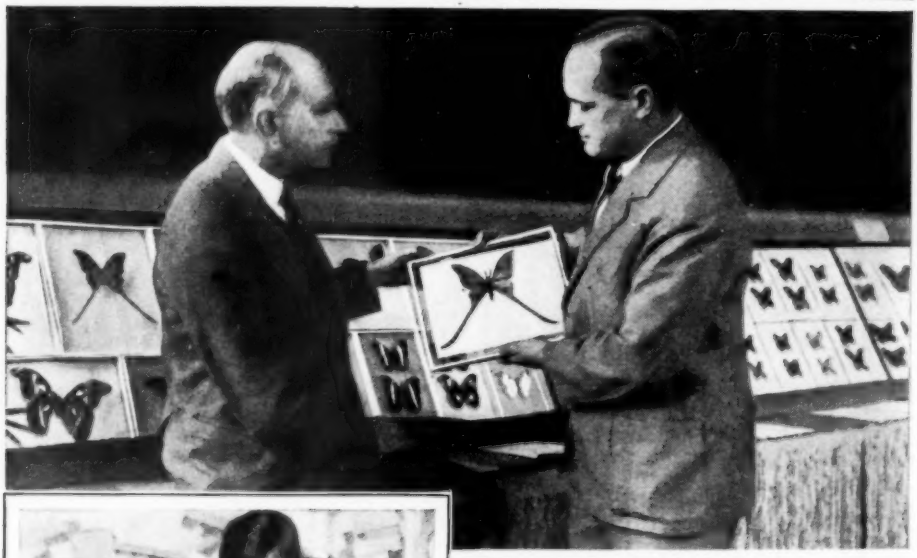
"There have been times when I have recruited bands of jungle natives and we have resorted to ruses in trapping the butterflies. There are certain valuable specimens which never come very close to earth. They shun the lower regions.

"For this class we erect towers, sometimes fifty feet high. At night we burn a bright light at the peak of this tower. This flare attracts the butterflies and the moths and the nets do the rest. There are other times when we build large bonfires. These bring good results also.

"Before I leave any single vicinity where I have gone in quest of butterflies, I manage to engage an agent acquainted with the ways of the civilized world. I teach him how to trap these desired butterflies, how to preserve and ship them to me. This is to guarantee a source for my product throughout the year.

"Butterflies are killed by using either a solution of cyanide of potassium or cyanide gas. The individual butterfly which is to

Are Butterflies Worth Money? Well, Here's One Valued at $5000.00!



The butterfly which the two men in the photo above are examining is valued at $5000. It is a rare specimen from Brazil, and is the property of the Philadelphia Academy of Natural Sciences.

Unpacking a shipment of butterflies. They are packed in boxes between layers of velvet cloth.

be shipped from a tropical zone to New York City is either placed in a chemically-treated envelope or packed in layers between velvet cloths in a box.

"No day passes that I do not receive a consignment of butterflies from one of my far-off outposts. I get all types of butterflies. Of course it is only the professional collector who can determine which ones have any value. You can appreciate the necessity of this knowledge when you realize that there are more than 3,000,000 species of insects in this world of ours, with tens of thousands of species of lepidoptera already classified. Of the strict butterfly class, there are more than 20,000 species and varieties known.

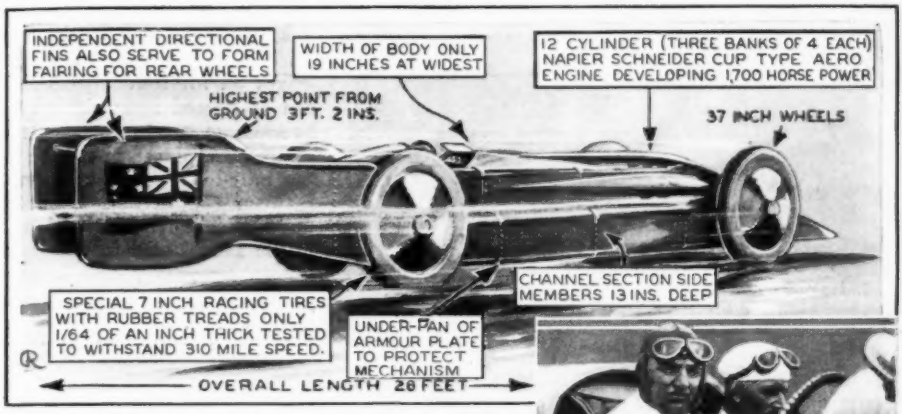
"In America there are more than 650 known species of butterflies. More are being discovered all of the time. Every now and then I will receive a package from some American collector which contains a specimen never before encountered by me.

"Before proceeding to the technical treatment of butterflies, I would like to point out the stages in a butterfly's life before it is fit to become a part of milady's necklace or ring.

"The cycle of the butterfly's being is one of the most remarkable shows in the world of life. I am referring to the transformation it undergoes from the egg to the caterpillar, then changing into the chrysalis and finally

(Continued on page 200)

Australian Car Seeks 300 m. p. h. Speed Mark


INDEPENDENT DIRECTIONAL FINS ALSO SERVE TO FORM FAIRING FOR REAR WHEELS
WIDTH OF BODY ONLY 19 INCHES AT WIDEST
12 CYLINDER (THREE BANKS OF 4 EACH) NAPIER SCHNEIDER CUP TYPE AERO ENGINE DEVELOPING 1,700 HORSE POWER
HIGHEST POINT FROM GROUND 3FT. 2 INS.
37 INCH WHEELS
CHANNEL SECTION SIDE MEMBERS 13 INS. DEEP
SPECIAL 7 INCH RACING TIRES WITH RUBBER TREADS ONLY 1/64 OF AN INCH THICK TESTED TO WITHSTAND 310 MILE SPEED.
UNDER-PAN OF ARMOUR PLATE TO PROTECT MECHANISM
OVERALL LENGTH 28 FEET

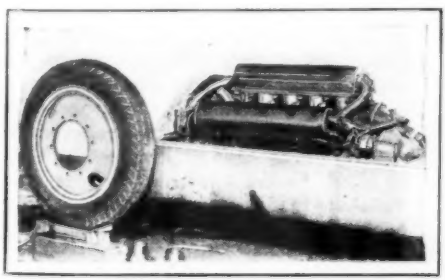
Features of the remarkable racing car being built by Norman Smith, the famous Australian racer, to attack existing auto speed records, are shown in the detailed drawing above. The car is only a couple of inches more than a yard in height above the ground, but is expected to attain the enormous speed of 300 miles per hour. Norman Smith is shown at the right, at the wheel of one of his cars, with his mechanician sitting beside him.

THE record speed of 245 miles an hour, set by Sir Malcolm Campbell in his Bluebird racer last February at Daytona Beach, is due to be broken if the marvelous new speed car being built by Norman Smith, the famous Australian racer, lives up to expectations. He expects to develop 300 miles an hour in his remarkable speed creation.

A 12-cylinder Napier Schneider cup type aero engine, lent him by the British government under a pledge of secrecy as regards mechanical details, will develop 1,700 horsepower. It is claimed to be the most efficient motor ever fitted to an automobile chassis. The drawing above shows the main features of the car, which, in common with all racers designed to attain tremendous speeds, makes use of streamlining to keep the machine in contact with the ground. Two rear fins, independently controlled, aid in steering and also serve as a fairing for the rear wheels.

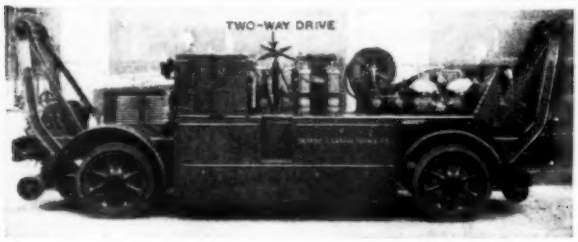
The car is exceedingly low slung, being built practically on a level with the wheel tops—only 3 feet 2 inches above the ground. Gearing is designed for speeds of 100 m.p.h. in first gear, 200 in second, and 300 in third. A novel double clutch will be used to minimize possibility of clutch slip and possible seizure. It will consist essentially of a friction clutch capable of transmitting up to 400 horsepower while the car is gathering speed; positive dogs will be engaged for the higher speeds. Drive shafts are enclosed in armor-plated tunnels of metal a quarter inch thick, to protect the driver who sits between them from injury in event of accident.

Tires will be specially built, capable of running at a speed of 310 miles an hour. They will be inflated to a pressure of 140 pounds to the square inch—almost five times as much as the conventional balloon tire. The tires are built up out of 12 plies of cotton cords, with a layer of rubber between each ply specially treated to prevent overheating at the tremendous speeds they will encounter. Mechanically operated brakes will be attached to the rear wheels only.



This is the Napier aero engine to be used in Smith's car. It is expected to develop 1700 h.p.

Ambulance, Fire, Wreck Truck in One Has Reversible Ends



Two independent steering wheels permit this combination ambulance, wrecking and fire truck, used for emergencies in Windsor-Detroit tunnel, to be steered from either end.

AN UNUSUAL combination of wrecking truck, fire truck and ambulance which drives on all four wheels and can be steered from either end by separate steering gear has recently been placed in service in the mile-long vehicular tunnel between Detroit and Windsor, Canada. The truck is stationed at the Detroit end in readiness for an emergency call in case of collision, mechanical break down, or fire.

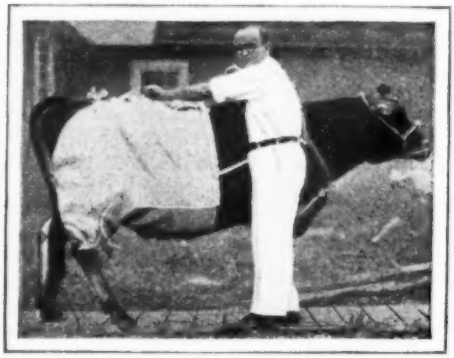
These independent steering wheels, each operating a separate axle, provide a maximum ease of maneuverability, and if necessary the truck can literally be driven sideways. Complete repair equipment is carried on the truck, together with fire-fighting and first aid paraphernalia.

Welding Supplants "Hot Rivets"

EVIDENCE that welding as a method of building construction has arrived at a point where it is cheaper than riveting in many cases is found in the construction of the new General Electric company building in Cleveland. Use of welding methods in fabricating the steel framework will save approximately $2.10 per ton.

Bossy Goes in for Canvas Bloomers

NOT for modesty's sake did the Department of Agriculture experts design canvas bloomers for old "Bossy," as shown in the photo below, but to aid them in studying the brown dog tick, an insect which is wreaking havoc among the cow population, causing a disease known as anaplasmosis. Serving to catch and imprison the tick, the bloomers are held on the cow by elastic suspenders, and are tied at the top to secure them in place.



These canvas bloomers worn by "Bossy" enable Department of Agriculture experts to study ticks.

Bobsled Racers Wear Novel Armor

Wearing their unique armor for protection in case of accident, H. A. Homburger and P. D. Bryant are here shown about to take off for race over bobsled course at Lake Placid, New York.

STRANGE looking armor, with frightful head gear like masks used in mysterious religious cults of darkest Africa, is worn by bobsled racers of Saranac Lake Sports Association. This unique armor, shown worn by two sportsmen in the photo above, serves to protect racers in case of accident as they speed along on the tracks, sometimes at a breath-taking gait of 85 miles per hour.

The suit which covers the body is heavily padded to absorb shock, thus preventing bone breaking, while the head piece which guards against fracture and serves as a windbreak is made of micarta or hard rubber.

SPARKS from the RADIO EDITOR

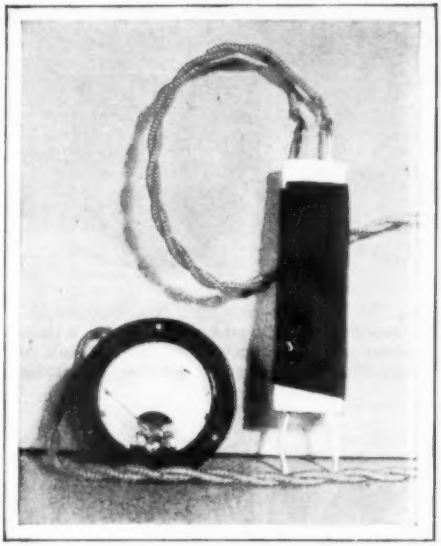
Edited by L. B. ROBBINS

Handy Experimenter's CIRCUIT Tester

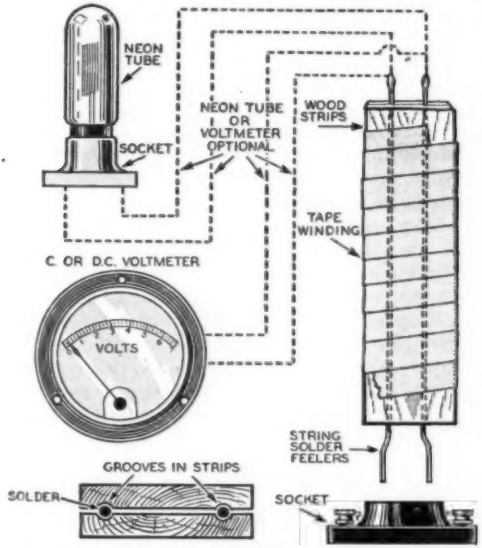
Novel and helpful stunts that will be of great interest to both radio beginners and advanced experimenters are presented this month. Mr. Robbins has studied readers' needs very carefully and has designed the various devices to suit them.

RADIO fans doing any amount of experimenting or service work need some sort of an instrument to test the voltages of the plate and filament circuits with which they work. A serviceable and easily made testing device which fills the bill satisfactorily is illustrated in the accompanying photo and drawing. A neon tube or voltmeter is optional as an indicator.

First, cut out two pieces of thin wood as shown in the drawing and score grooves lengthwise near the edges of each one. Then place in each groove a piece of round string solder or a piece of stiff wire (what you use depends upon the work you are doing), allowing the ends to project out top and bottom as illustrated in the sketch. Next, bolt the two pieces together, being careful not to touch the solder with the bolts, and bind the whole affair with friction tape.



Here is the completed tester, using string solder feelers and voltmeter to indicate filament voltage.



Either voltmeter or neon tube is wired to projecting feelers at top of tester as illustrated in this drawing.

Now comes the job of hooking on the indicator, which is done by simply soldering a length of lamp cord to the projecting wire. If you are testing filament circuits, you can use a 0-15 voltmeter, with string solder feelers to plug into the tube socket contacts.

If you are testing high voltage plate circuits, use a neon tube, with feelers of stiff wire, filed to a point to penetrate the insulation of the wires. The neon tube will glow red when a current is passing and remain dark if the circuit is dead.

A Beginner's Broadcast

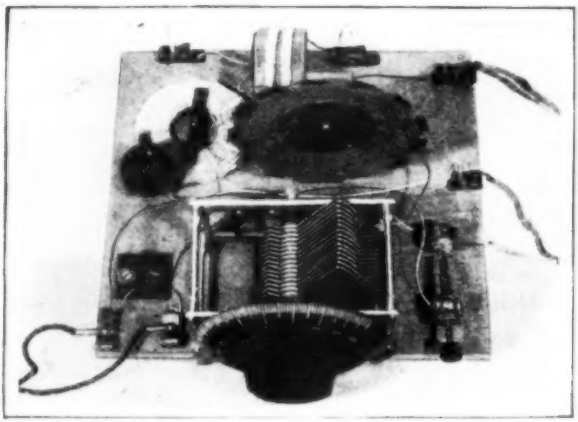


Fig. 1. Here is the completed crystal broadcast receiver, with parts mounted bread-board style. Tuning is done with variable condenser and switch arm of the antenna coil. Volume is regulated by adjusting the crystal detector for maximum sensitivity.

Here's a simple, selective little crystal broadcast receiver that will be just the thing for radio beginners. It's easy to construct, and properly assembled it will bring in clearly all the stations in your town.

SO LONG as broadcasting continues, the crystal receiver will be popular with folks situated near broadcasting stations and with limited capital. The crystal receiver shown in the accompanying photographs and sketches is intended for just those persons, especially beginners, who like to build their own, and want as good a crystal set as they can make for little money and one that is simple to construct. This one fills the bill in every respect, and it should not run you more than two to three dollars at present day prices for parts.

The baseboard can be any clean board about 10 in. long by 8 inches wide. No panel is used, the parts being assembled on the base breadboard style, as illustrated in Fig. 1 and in top drawing in Fig. 3. Two or three little angle irons can be fastened to the .0005 mfd. condenser and screwed to the base to hold the instrument rigid.

Now comes the winding of the coils upon which the selectivity of the set depends. Both coils are wound "spiderweb" fashion on homemade forms. Fig. 2 shows the form, which is a 4½ inch disc of heavy cardboard or fiber, so cut as to furnish thirteen spokes.

Securing about a foot of No. 22 DCC wire to the center of the form by weaving it in a couple of small holes, wind on 60 turns of the wire by drawing it first over and then under every other spoke until the coil is completed. Then fasten the outer end by weaving it through small holes in the outer end of the spoke, leaving plenty of spare wire for making connections. Lay this coil flat on the baseboard and fasten it down with a strip of wood or bakelite as shown in Fig. 3.

The vertical coil is wound in the same manner, but consists of two windings made as

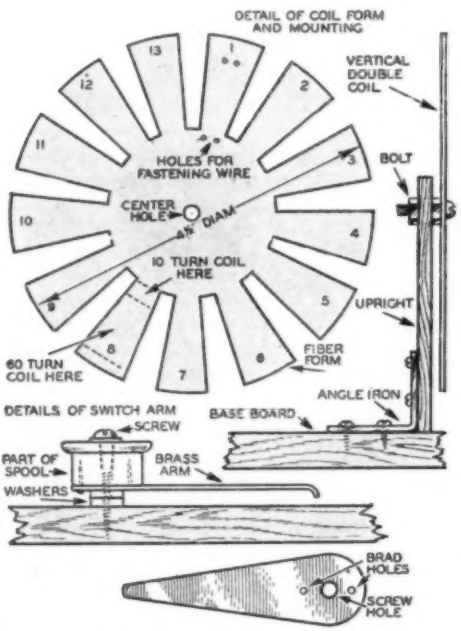


Fig. 2. Fiber forms for tuning coils should be cut to the pattern shown in above drawing, and wires wound in and out of slots. Vertical coil is mounted on upright as illustrated. Contact to brass switch arm for tuning should be made through washers.

Receiver for Three Dollars

follows: Starting at the inside end of spokes, wind on ten turns of No. 22 DCC as previously described. Then, starting at the top of this ten turn coil wind on a separate coil of 60 turns, ending it at the outer end of the spokes. Bolt a light stick to the back of the form and mount the coil vertically on the baseboard with a small angle iron, in the manner illustrated in Fig. 2.

Then wind a third coil on a section of round mailing tube and tack it to the base near the rear edge. This is for the buzzer test to determine sensitivity of the crystal. The coil consists of two separate windings of about five turns each, one for the ground circuit, the other for the buzzer circuit.

To wire up the receiver proceed as follows: The inside end of the antenna coil should be connected to the inside end of the 10 turn winding on the vertical coil, and the upper end of the 10 turn coil connected to the outside end of the winding on the ground buzzer coil. Then connect the inside end of this coil to the spring clip marked "Ground."

Leave the top end of the antenna coil disconnected, but scrape the insulation bare up the full length of one spoke as indicated in Fig. 3. Mount a spring metal switch arm to turn on the baseboard close to the coil so the point of arm will make good contact with these bared wires. Solder a wire to the switch arm and connect directly with the antenna clip on base.

Next, connect the inside end of the 60 turn winding on the vertical coil to the stator or stationary plates of the .0005 variable condenser and to one side of the .00025 fixed condenser. The top turn on the coil is then connected to the rotor or movable plates of the .0005 condenser and to one side of the crystal. Then connect the remaining crystal terminal to the remaining side of the .00025 fixed condenser shunted across the phones.

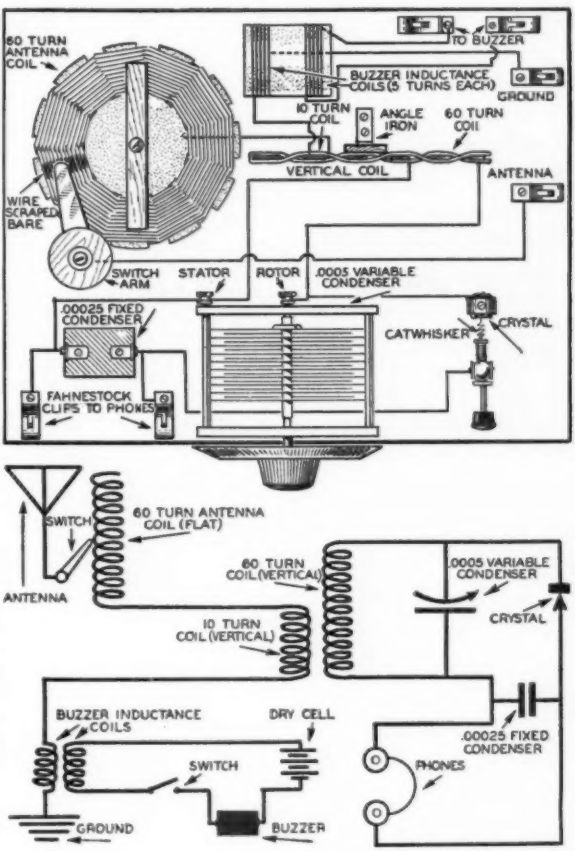
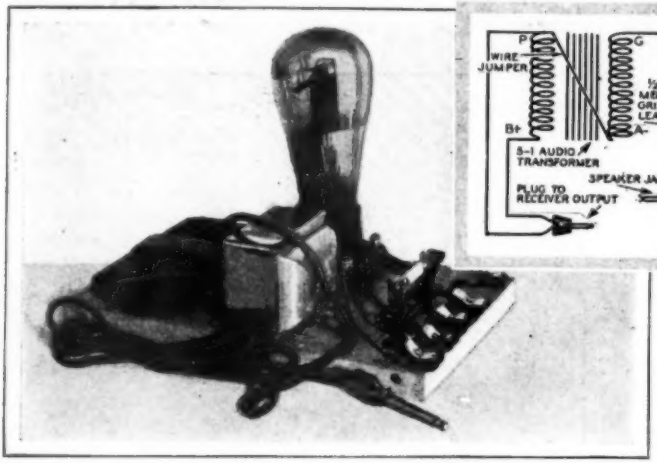


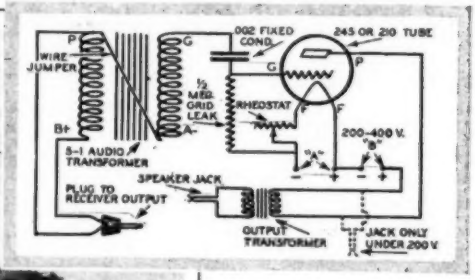
Fig. 3. Parts for receiver are arranged on baseboard and wired up as illustrated in above drawings. Variable condenser can be mounted by means of two angle irons screwed to baseboard.

To tune in a station set the crystal for a sensitive spot. When a sensitive spot has been found the buzzer will be clearly heard in the phones. Then switch off the buzzer and put the switch arm about half way across the antenna coil and turn the variable condenser slowly until a broadcasting station is heard. Vary the switch contact and condenser setting until the signals are the loudest. Thus several stations broadcasting on different frequencies in the same city can be tuned in or out quite nicely.

A Power Amplifier to Boost Volume of Your Battery Set



Parts for power amplifier are mounted on the baseboard in the positions shown in above photo. Note insulated jumper on transformer terminals. The plug goes to the output jack of the receiver.



Here is simple wiring diagram for volume booster.

IF YOU are thinking about taking your battery set to camp this summer you may want more volume than you have hitherto been able to get from it. If such is the case, then here is a simple power amplifier that will fill your needs satisfactorily. Constructed from extra parts usually found about the workbench, it will carry the extra volume without any great distortion and will aid greatly in bringing in stations with a suitable level of audibility.

Use any piece of board about 6x8 inches for a base. On it mount a UX or UV socket, a 5 to 1 audio transformer of good quality, a .002 fixed condenser capable of carrying up to 500 volts, a grid leak mounting and a single circuit jack. Then along one edge place four binding posts or Fahnestock clips.

Connect the "P" and "B plus" terminals of the transformer with a long double cord and headphone plug. Then, with a well insulated wire, connect the "P" terminal to the "A minus" terminal of the secondary winding as illustrated in the wiring diagram above. The "G" or grid terminal of the secondary is then connected to one side of the .002 fixed condenser. Connect the other side of the condenser to the "G" terminal of the socket and to one side of the leak mounting.

Mark the binding posts "A minus", "A plus", "B minus" and "B plus". This done, you are ready for wiring. Connect "A minus" to one filament terminal of the socket and to the remaining side of the leak mounting, and connect "A plus" to the other socket filament terminal and the "B minus" post. "B plus" post is then connected to one side of the jack and the remaining side of jack is connected to P post on the socket. If a jack is not obtainable use two clips as shown in the photo. For voltages over 200 the "B plus" and plate of tube had best be connected to the primary of a 1 to 1 ratio output transformer and the secondary connected to the jack. This will prevent the DC from burning out the speaker windings.

For great volume use a 250 tube and about 400 volts of "B" battery. For a 210 tube use up to 350 volts; for a 245 tube from 150 to 200 volts; and for a 171 tube about 180 volts. Use separate "A" and "B" supply for this amplifier and for a 171 use 5 volts, for 245 use 2½ volts and for the 210 and 250 tubes use 7½ volts. Clarity of tone can be adjusted by trying different grid leak values although the ½ Meg. will suffice under ordinary circumstances.

To use, simply turn on the receiver and the amplifier, plug the amplifier into the output jack of the receiver and then plug the speaker into the amplifier output jack. A rheostat can be used in the filament supply if desired, and should be inserted in the "A minus" side.

If you want to use a "C" battery instead of a leak use 22½ to 84 volts, depending upon the tube. Connect "C minus" to grid of the tube and "C plus" to minus of "A" battery.

Los Angeles Youth Makes Artistic Clay Miniatures

REMARKABLE miniatures in clay are being turned out by 22-year-old Jose Saldibar, whose miniature pottery works is flourishing in El Paseo de Los Angeles, the "Mexican Street of Yesterday," as its habitues love to call it. This artist turns out exquisite baked clay figures in less than the space of an inch.

Jose Saldibar is shown at work in his studio, shaping the intricate miniatures of Mexican life for which he is famed. The figures are modeled in clay, then baked and glazed.

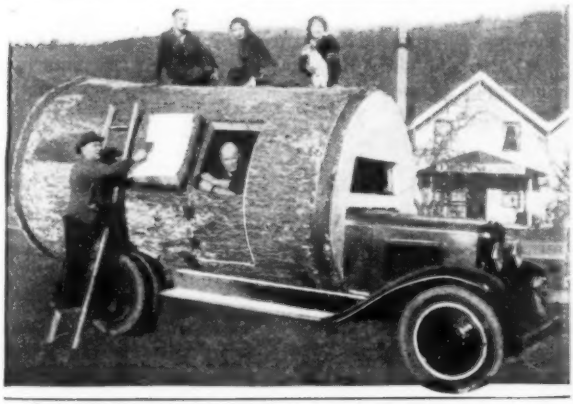
Dilemma for Vegetarians

THERE is no real difference between animals and plants, according to Professor Gottlieb Haberlandt, of Berlin. The conventional tests that only animals breathe and that only plants live on mineral food may apply to the majority of plants and animals, but there are many exceptions.

There are numerous plants which do not draw their nourishment from the soil, but must live like animals on vegetable or animal matter. On the other hand, there are certain lowly animals which apparently can draw nutriment from inorganic salts and solutions as is done by some plant roots.

Washington Family Will Tour Nation in Hollow Log Placed on Wheels

CYRUS T. GATES of Deming, Washington, has just completed a novel home on wheels in which he and his family plan to tour the nation. This motor home consists of a large spruce log, hollowed out and mounted on the chassis of a large Chevrolet truck. The log, which is fourteen feet long and eight feet across at the butt end, was hollowed out almost entirely by hand. An electric drill was used at both ends to start the hole, and then a small electric band saw was used to saw out small sections which were split out with iron bars flattened and sharpened at one end. The sides and ceiling were cut round, with a flat section left for the floor.



Cyrus T. Gates and family with their novel motor home.

Two bands of steel are fastened around the log to prevent cracking as it dries out. Bunks that will fold into the wall have been added, while a complete kitchen is installed at the rear.

Uncle Sam's Poison Squad

Laboratory workers examine suspected samples of poisoned food, submitting them to chemical and microscopic analysis. Spoiled foods and those accidentally mixed with arsenic are main sources of trouble.

"TELEGRAM for the chief," sang out an office boy, dropping the message on the secretary's desk. It read:

> **"Twenty people poisoned; two dead. Community fear running high. A fiend must be at work."**

Within an hour, members of the Government "Poison Squad" were speeding to the scene of the outbreak. They interviewed victims on sick beds; samples of foods eaten were obtained and subjected to chemical and bacteriological analysis. Nothing poisonous whatever was found in the suspected foods.

Then the daughter of one of the victims told an investigator of her father's habit of drinking old maid's tea,—sugar and water. She recalled now that the water had momentarily turned pink when she added the sugar. The cup? Examination of the dregs showed unmistakable traces of arsenic.

The grocer who sold the sugar said he had no arsenic, but a local druggist was found who had sold him an arsenical poison six months before. The poison was in a paper sack inside a pasteboard box labeled "POISON". Customers complained upon seeing this package on an upper shelf, whereupon the grocer removed the outer wrapper and returned the inner sack to the shelf. Subsequently this sack got mixed with some one pound packages of sugar that had become soiled, and the grocer had dumped the lot into a barrel for repackaging.

Thus another of the scores of perplexing food poisoning outbreaks that occur annually in the United States was solved by the "Poison Squad"—a group of Government Food chemists and bacteriologists whose job it is to investigate every case of food poisoning, not only to run down the case in

How to Guard Against Food Poisoning

Label all poisons plainly and store away from food products.

Wash food to be eaten raw in clean water; make sure the food has no rotted or moldy areas.

Heat cooked foods to the boiling point.

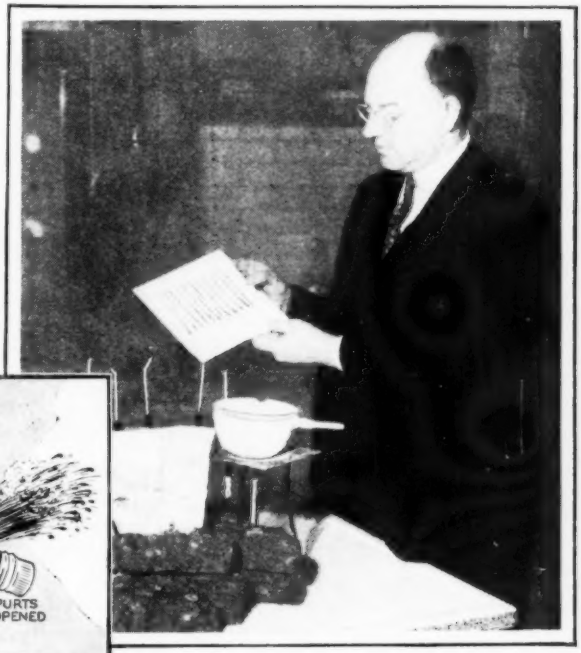
Keep left-over foods in a refrigerator.

Don't use food from cans showing swelled lids or cloudy contents.

Safeguards Your Food Supply

by C. MORAN

Poisoned food epidemics are becoming increasingly rare, thanks to the eternal vigilance waged by government squads of "poison chasers" who relentlessly track down contaminated food shipments. This article tells you how to guard against poisoned food in your home.



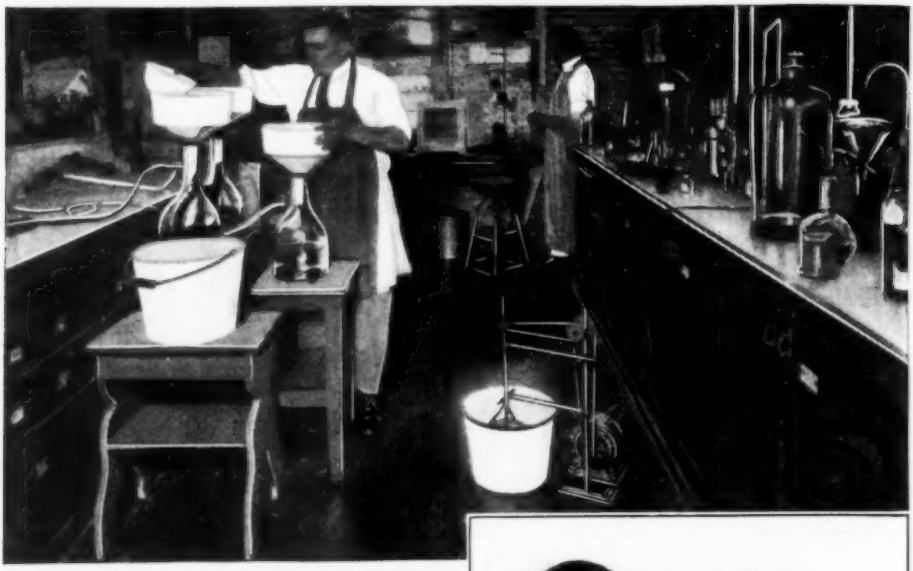
The fruit cake in the foreground contains enough arsenic to kill a dozen families. The inspector is analyzing its poison content. The job of tracking down this cake, as recounted in this article, is a thrilling instance of the Poison Squad's work.

Never eat food from containers exhibiting the characteristics shown in this drawing. These danger signs warn of spoiled or poisoned contents.

hand but in order that the entire supply of the poisonous substance may be seized.

Most poison cases, according to Inspector G. P. Larrick, of the Federal Poison Squad, who recently conducted an international chase after a poisonous fruit cake destined for a Canadian family, are the result of negligence in the preparation and handling of foods in the home. Hence, poison outbreaks are most frequent following community picnics, club suppers, and other forms of get-together feasts where the food is contributed by various participants. This type of case is difficult to solve because of the many sources from which the food is derived.

The solution of criminal poison cases, on the other hand, is comparatively easy, inasmuch as the motive usually is readily ascertained and the sale of the poison can usually be traced. In a typical case, a family in Ohio became ill with gastric trouble, and one member of the family died. The Poison Squad analyzed samples of food eaten but found nothing of a poisonous nature. A canvass of retail drug stores disclosed that the family cook had recently bought some rat poison. The cook confessed that she had dumped this poison into the coffee, and she was subsequently convicted of murder.



The apparatus which the man in the foreground is filling through the funnels is a "glass stomach," so-called because human processes of digestion are repeated inside it to test presence of poisons.

These laboratory workers are examining samples of food taken from the glass jar on the table which proved to contain botulinus germs—one of the deadliest of food poisons.

The prevention of nation-wide poisoning epidemics is the primary interest of the Federal government in running down food poisonings. An extensive system of cooperation between Federal, State and local health authorities has been developed to this end, whereby prompt seizures of poisonous goods are made wherever the products may be in the channels from manufacturer to consumer. For administrative purposes the nation is divided into ten sections, to each of which is attached a member of the Federal Poison Squad. Only men who have had long experience in food and drug law enforcement are assigned to this duty. Immediately upon notification of a food poisoning case, an inspector rushes to the scene, gathers all available samples of food, dispatches these to a government laboratory, and interviews the victims.

When a food in general distribution is found to be poisonous, it is trailed back to the grocer who sold it, to the wholesaler, and to the manufacturer. The distribution of every lot is ascertained, and local and State health officers are furnished the names and addresses of the food handlers involved in their immediate jurisdictions. If necessary, the foods are trailed to the ultimate consumers, and depending on the seriousness of the case, a general alarm may be broadcast throughout the community by means of radio or the daily press.

The efficiency of this system is exemplified

by the so-called Chicago onion poisoning case. In this case, investigation of the death of one man and the serious illness of another in the Windy City disclosed that the victims had eaten imported canned onions which contained the virulent toxin that causes botulism, one of the most dangerous forms of food poisoning known. The onions had been packed in Italy and distributed by a New York representative to many cities and towns in the East and Middle West.

The Poison Squad obtained the names and addresses of all dealers to whom shipments had been made, and the telegraph wires were soon singing with seizure orders. Shipments were located in twenty-five cities. The bacteriologists examined 368 cans taken as samples and found 22 cans so highly toxic as to cause death when fed to guinea pigs; 30 others yielded cultures that produced toxin fatal to guinea pigs. The case was cleaned up within forty-eight hours.

Food from fruit stores, which is usually eaten raw, should be fresh, clean, free from abnormal odors and rotted or molded areas, and should be washed in clean water fit for drinking.

The Federal officials explain that it is possible to seize goods before they have gone into consumption on a nation-wide scale because usually the first poison case is located close to the source of original distribution, and in most instances the case is solved while the bulk of the supplies are still en route to distant markets. Legitimate food processors and packers lend every cooperation in this work. The only exception to this situation in recent years was the epidemic of ginger Jake paralysis last summer, which could not be run down promptly because of the "bootlegging" elements in the case.

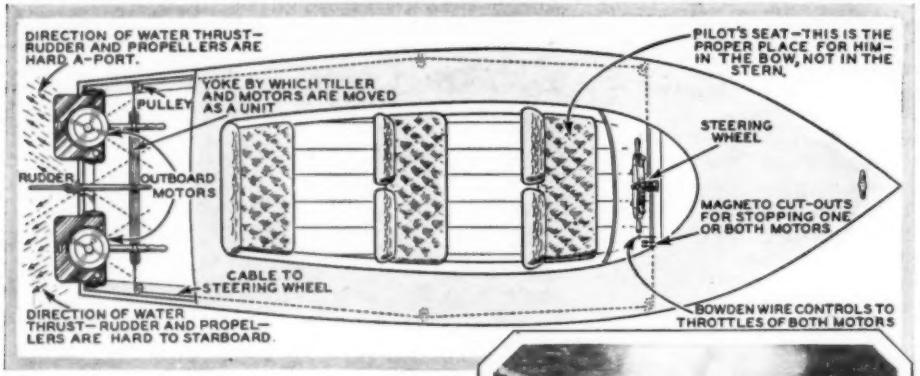
In the laboratory, foods are subjected to every known chemical and bacteriological test; they are fed to guinea pigs; recently a glass stomach has been invented in which digestive processes simulating those of the human stomach may be observed. The chemists use this artificial stomach in which to determine the digestibility of the protein in foods. The proteins to be tested are placed in glass containers in a dilute solution of hydrochloric acid similar to that found normally in the human stomach, the proper quantity of pepsin is added, and the mixture is placed in an incubator where the temperature is kept at the same point as that of the human stomach, about 37 degrees centigrade.

After a certain number of hours the contents of the container are sampled and analyzed. The digestive effect is measured by the ratio of what is known as amino nitrogen to total nitrogen. After the food has been acted upon by the pepsin and hydrochloric acid, it is treated with trypsin and a dilute alkaline solution, as nearly as possible like the digestive juices found in the small intestine. This process tells the investigator what the probable digestive action on any particular food will be in the intestine.

A specimen of fruit cake which was said to have made four people in Virginia violently

(Continued on page 190)

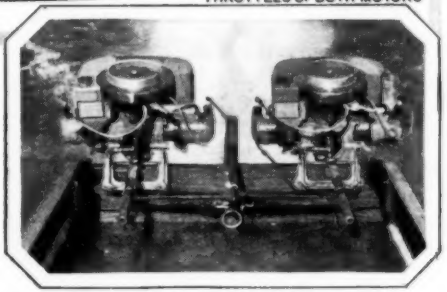
Two Outboard Motors and Rudder Are Handled as One


DIRECTION OF WATER THRUST— RUDDER AND PROPELLERS ARE HARD A-PORT.
PULLEY
YOKE BY WHICH TILLER AND MOTORS ARE MOVED AS A UNIT
RUDDER
OUTBOARD MOTORS
CABLE TO STEERING WHEEL
DIRECTION OF WATER THRUST— RUDDER AND PROPELLERS ARE HARD TO STARBOARD.
PILOT'S SEAT—THIS IS THE PROPER PLACE FOR HIM— IN THE BOW, NOT IN THE STERN.
STEERING WHEEL
MAGNETO CUT-OUTS FOR STOPPING ONE OR BOTH MOTORS
BOWDEN WIRE CONTROLS TO THROTTLES OF BOTH MOTORS

This drawing shows how the outboard motors and rudder are rigged up as a complete unit.

THE outboard motor method of steering with the propeller is highly efficient, but it has the disadvantage of putting the boat completely out of control the instant the motors are shut down.

This disadvantage may be overcome, especially on larger boats which can use the power of two motors, by adding a rudder and connecting it with the two motors as shown in the above drawing. Of course the motors must be of the same type and the propellers must turn in opposite directions. This rig places the pilot in front where he should be.



The two power plants on the stern of the boat, showing the mechanism by which both motors are controlled as one from the pilot's seat forward. Note the rudder mounted between the two motors.

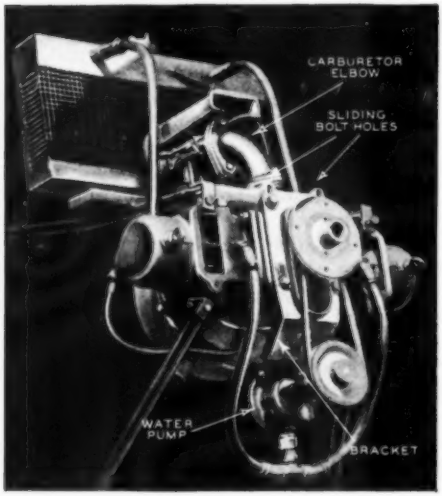


Photo above shows a 16 h. p. outboard boat motor converted for use as an inexpensive glider engine.

Outboard Motor Glider Engine

USING the power head from an Evinrude 16 h. p. outboard boat motor, a Minneapolis man has developed a satisfactory glider engine at small expense. The only parts required for conversion were one casting, one small automobile water pump, a small piece of honeycomb radiator core and an elbow for the carburetor.

The first operation is to remove the lower part of the housing at the motor base. This does away with the lower drive unit and exposes a good stub shaft, splined, which makes it easy to install a propeller hub.

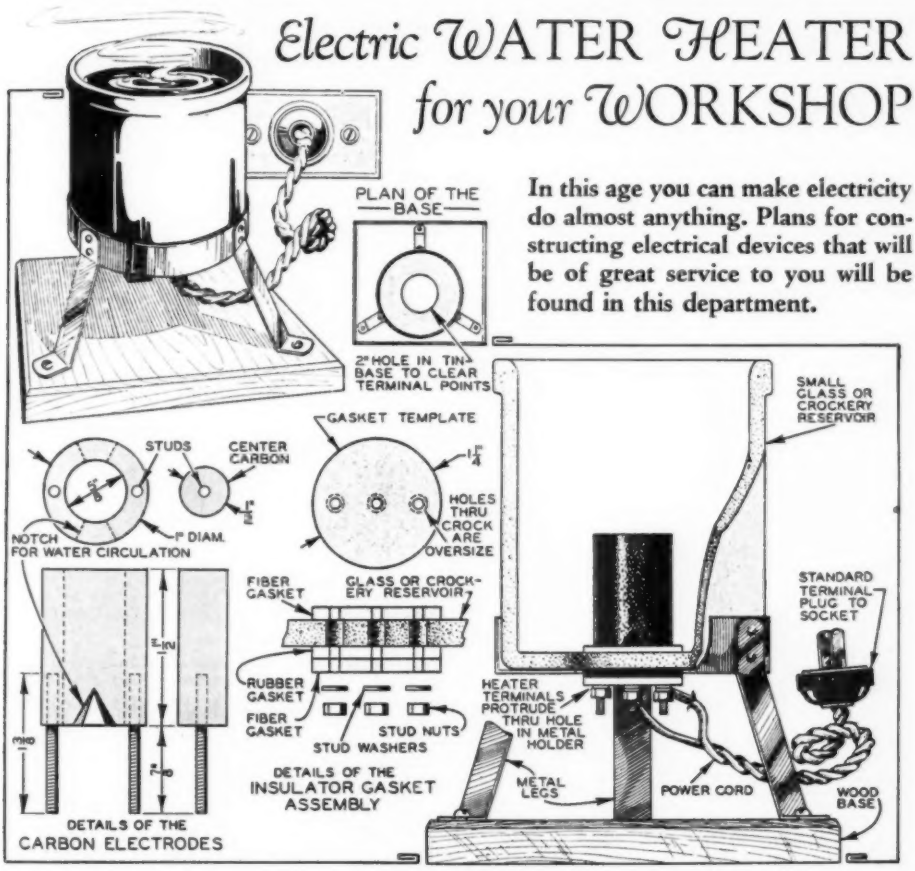
A small angle bracket is made with sliding bolt holes to go around studs screwed into the part where the propeller housing was fastened. On this is mounted a small water pump. The water intakes are as they are in the outboard, and the water outlets run into the honeycomb radiator which is 15″x3″x 10″. Water is sent to the pump intake from the bottom of the radiator core. The muffler is, of course, removed.

Amateur Electrician

Edited by SEWELL LEHMAN

Electric WATER HEATER *for your* WORKSHOP

In this age you can make electricity do almost anything. Plans for constructing electrical devices that will be of great service to you will be found in this department.



Carbon electrodes which heat the water are mounted in the crockery reservoir as illustrated above.

HERE'S a handy little electric water heater for your workshop that will do away with the danger of smouldering matches and will work for hours at practically nothing. The water container is simply a glass or crockery reservoir of some kind, about three inches in diameter and four inches deep. The heating elements consist simply of two pieces of carbon, one solid, the other hollow, a 5/8 in. hole being drilled down through the exact center, and two notches filed in the bottom as shown in the above drawings. Holes are bored also in both electrodes for the brass studs, as illustrated.

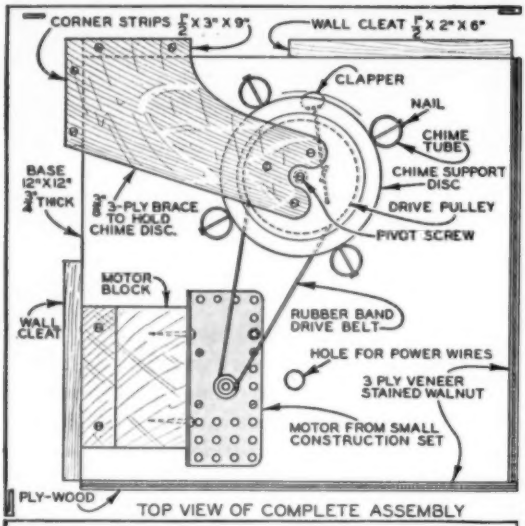
This done, drill three holes in line in the bottom of the container to take these studs, and then make two fiber and one rubber gasket, drilled in the same manner, to serve as insulators. Finally bolt the electrodes to the bottom of the container with stud nuts and washers, and then hook a double strand electric cord to each electrode to supply the current. The container is supported by means of a holder made as shown in above sketch.

CHIMES for

by

DALE R. VAN HORN

A chord of pleasing, melodious tones sounds out from this unique door bell when a visitor comes. And installed in a corner of a wall, it makes an attractive ornament.



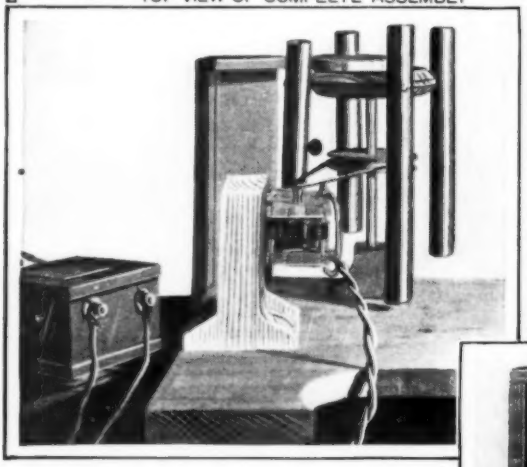
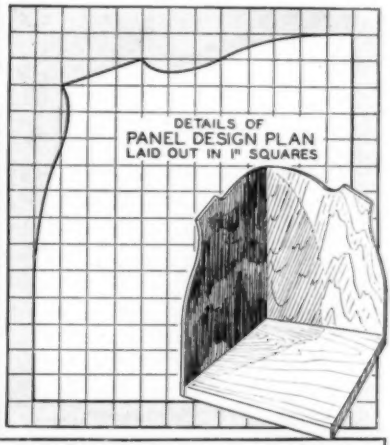


Fig. 1. Parts for bell are arranged on baseboard as shown in top drawing. Photo shows completed bell.

A NOVEL door bell that sounds out with pleasant musical chimes when you have visitors will not only make an unique and artistic piece of equipment for your home, but it will also eliminate the harsh clatter of the customary door bell used to announce guests. Such a door bell is very easy to construct and install, and all you need to make it is an Erector motor, a toy train transformer, a few pieces of scrap wood, and about three feet of brass pipe, approximately 3/64 in. thick and ⅞ in. in diameter.

The motor and chimes are both mounted on a baseboard 12 inches square, the chimes



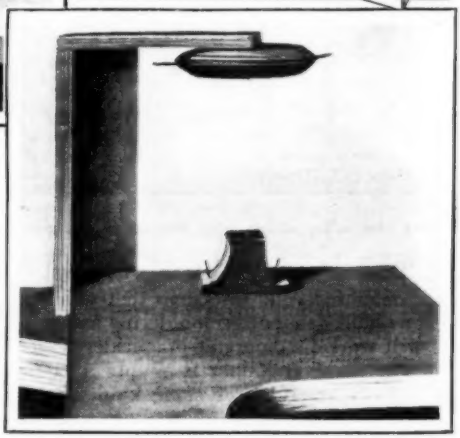


Fig. 2. Design for panel to conceal mechanism of bell is first laid out on the sheet of squared paper as illustrated in top drawing. Circular disk to support brass pipe chimes is attached to projecting arm at top as shown in photo.

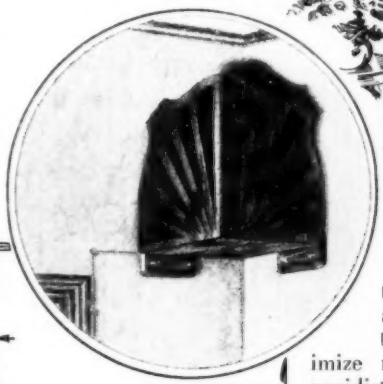
Your Door Bell

being supported by corner strips ½"x-3"x9", screwed to the base board as illustrated in Fig. 1. For the top fashion the irregular shaped piece shown in the same drawing, cutting one end square to fit these upright corner strips.

The brass pipe chimes of the door bell are cut to the dimensions given in Fig. 3 to give tones "A", "F", "C" and "A". However, you may have to alter the lengths a little. It's a good idea to match the tones with a piano, grinding down the pieces if necessary. When you have tuned them satisfactorily, bore holes in each one as illustrated in Fig. 3 for attachment to the circular disc.

These brass pipe chimes depend from a circular disc screwed to a forementioned irregular shaped projecting arm, as illustrated in Fig. 1. Around the edge, cut to a "V" shape to minimize rubbing of the pipes, mark four equidistantly spaced points and drive in six penny nails to hold the pipes, as illustrated in Fig. 4. Finally bore a hole for a 1½ in. screw in the center, making it large enough so that the screw can turn freely.

Mounted in corner of wall as shown here the bell makes an attractive ornament.



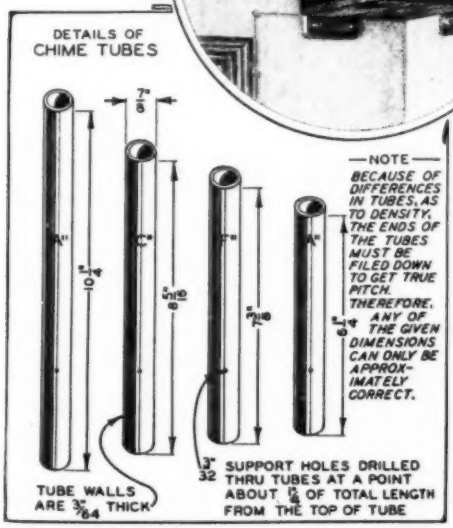

DETAILS OF CHIME TUBES
7" 6
A"
10¼
C"
5 5/16
F"
7 3/16
A"
5 1/4
NOTE
BECAUSE OF DIFFERENCES IN TUBES, AS TO DENSITY, THE ENDS OF THE TUBES MUST BE FILED DOWN TO GET TRUE PITCH. THEREFORE, ANY OF THE GIVEN DIMENSIONS CAN ONLY BE APPROXIMATELY CORRECT.
TUBE WALLS ARE 3/64 THICK
3/32
SUPPORT HOLES DRILLED THRU TUBES AT A POINT ABOUT 1/4 OF TOTAL LENGTH FROM THE TOP OF TUBE

Fig. 3. Approximate lengths of brass tubes for notes "A", "F", "C" and "A" are given in above drawing. Tuning them with piano will give the exact lengths. If pitch is too low, shorten the pipe by filing or grinding down length. Holes are drilled through about ¼ of length from end of tube.

Next comes the task of constructing the clapper drive wheel, shown in Figs. 4 and 5. A ⅜ in. dowel rod 7½ in. in length is needed to make the vertical drive shaft on which the clapper wheel turns. To make the wheel, turn out of ½ in. wood a disc 3¼ in. in diameter, with a groove ¼ in. deep and sandpapered very smooth. Finally, bore a ⅜ in. hole to take the dowel rod shaft.

To the upper face of this drive wheel is fitted the clapper which strikes the chimes as it revolves. The clapper is made from the head of a clothespin, as illustrated in Fig. 4. First bore a small hole in the head, then obtain a 3½ in. length of steel wire, double over the end as shown, and thrust it into the

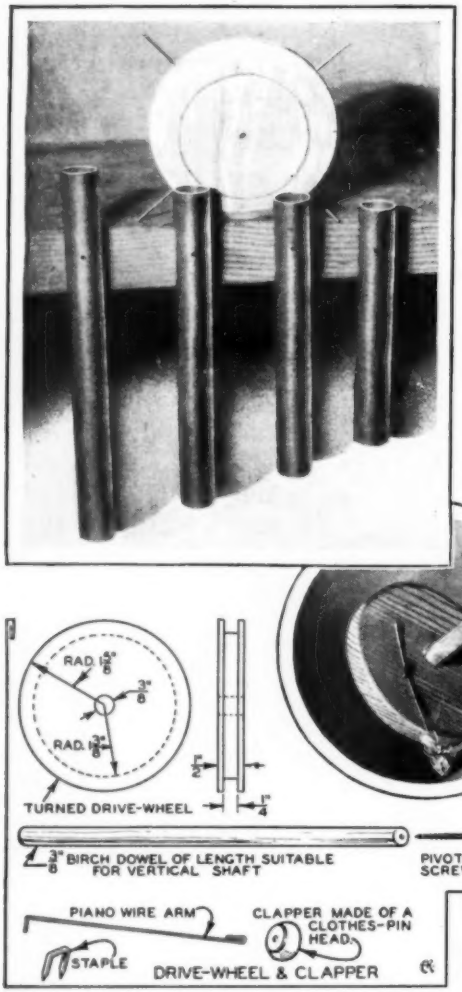


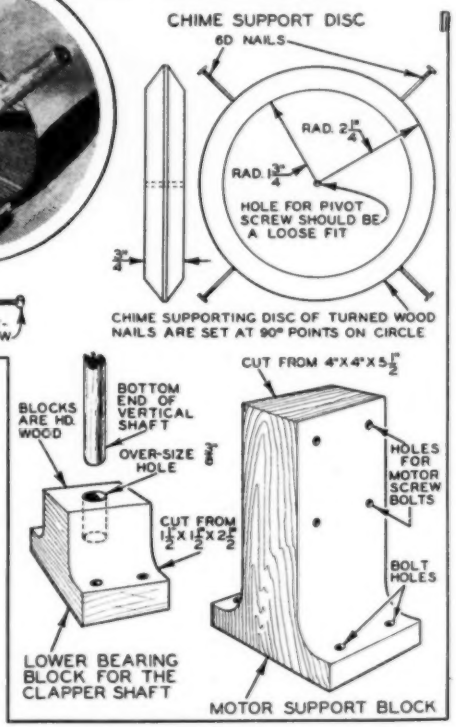
Fig. 4. Above photo shows the tubes cut and drilled, ready for mounting on circular disk. Inset shows clapper arm fastened to pulley. Drawings give the dimensions of drive wheel and clapper.

hole, pulling it out the other side and locking it securely in place. Next bend the other end of the wire at an angle, drive it into the wood of the pulley, and nail down with a small staple. The clapper should extend out far enough beyond the rim to just touch the pipes as it revolves.

Bearings for this revolving dowel rod shaft consist of a block at the bottom cut to the dimensions shown in Fig. 5. A 7/16 in. hole is bored through the center and the lower end of the rod set in it. A good soaking in oil will allow the shaft to turn easily. At the top of the rod bore a small hole to take a 1½ in. brass screw, and after setting the clapper drive assembly in place, insert the screw through the chime support disc, screwing it down into the rod. A little oil here will also make for smoother turning.

Now for the motor set-up—the final task. The type used was mounted on a special wood block cut to dimensions given in Fig 5, then nailed and glued to the base board.

At this point the bell should be thoroughly tested. Hook up the transformer to a nearby socket and touch the lead wires to the motor terminals. If the clapper strikes too harshly, bend the wire to give a softer tone. If the motor turns the vertical shaft at too high a speed, you can reduce the amperage by adjusting the transformer. When the tests prove satisfactory, glue the drive pulley to the dowel, and add the panel.

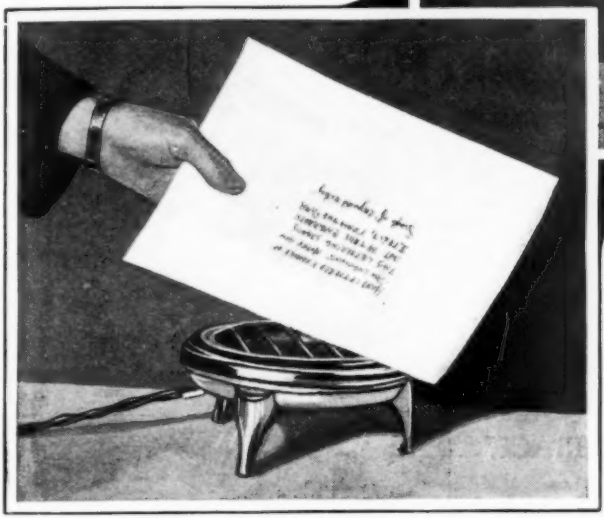

CHIME SUPPORT DISC
6D NAILS
RAD. 2¼"
RAD. 1¾"
HOLE FOR PIVOT SCREW SHOULD BE A LOOSE FIT
CHIME SUPPORTING DISC OF TURNED WOOD
NAILS ARE SET AT 90° POINTS ON CIRCLE
BOTTOM END OF VERTICAL SHAFT
BLOCKS ARE HD. WOOD
OVER-SIZE HOLE
CUT FROM 1½ X 1½ X 2½
LOWER BEARING BLOCK FOR THE CLAPPER SHAFT
CUT FROM 4" X 4" X 5½"
HOLES FOR MOTOR SCREW BOLTS
BOLT HOLES
MOTOR SUPPORT BLOCK

Pipe chimes are supported by nails driven in edge of disk, dimensions of which are given in top drawing. The lower drawing shows motor block and block bearing for bottom of dowel rod shaft.

Glossy Raised Gold Writing Done With an Ordinary Pen

ORDINARY pen-written, or lettered, work may be made to have the appearance and attractiveness of expensive commercial engraving with but slight additional preparation which requires no skill beyond the ability to write neatly and to letter fairly well.

Engraved writing, as it may be called, is useful and ornamental in "engraving" small quantities of letterheads, invitations, announcements, or for anything where you desire to add unusual distinction and beauty to the result. By this process the writing stands from the paper in solid, glossy relief in any color desired and also in a warm gold, bright silver or rare old copper finish.



Heating the treated writing causes the powder to fuse or "emboss."

The embossing powder is spread over the ink while still wet, and the surplus poured back into the can. Any printer will sell you the embossing powder.

An ordinary steel pen point is used, but the ink is special and must be manufactured yourself. It consists of a good grade printer's ink thinned to writing consistency with synthetic wintergreen, which is known under the chemical name of methyl salicylate and costs a fifth as much as the genuine oil.

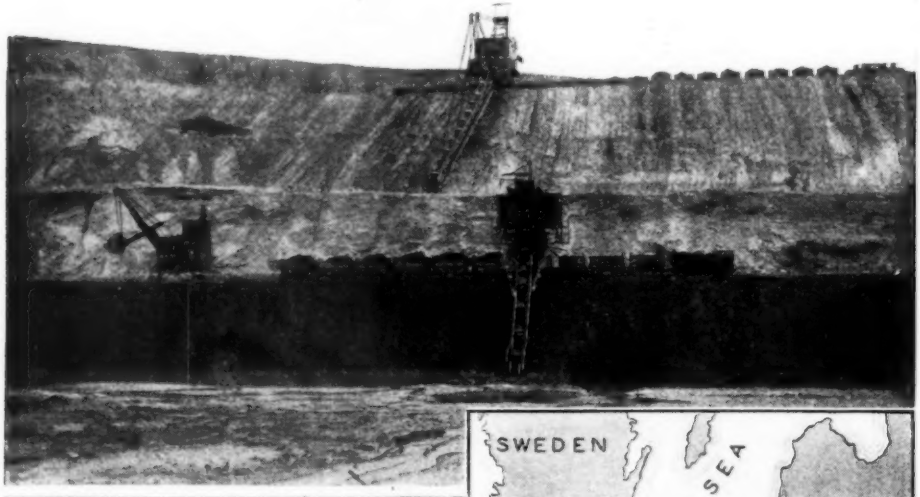
Place the printer's ink in a dish or wide mouth bottle and add the oil drop by drop, thoroughly mixing. The ink should be tested frequently; when it is just thin enough so that it will easily flow from the pen, it is ready for use. If the ink is too thick it will fail to write easily; if too thin it will spread out into the fibers of the paper, producing a blurred effect.

Write what you wish on a sheet of firm paper with the ink above described, using special care and caution that the lines are neat and clear. Then, before the ink has dried, cover the writing with embossing powder.

Embossing powder is a compound used by printing establishments for producing raised printing on a printing press. It consists of various powdered resins mixed together, either plain or with coloring matter or bronze powders. It can be purchased at any printer's supply house.

The powder is poured back into the can and any excess blown from the paper. Then hold the sheet over an electric heater, or the ordinary heating stove will do, until the lines of the writing just melt. It should immediately be withdrawn. The writing cools at once, and will be found hard, glossy and in relief from the paper as in process engraving.

"Baltic Gold" MINED



Dredges are used in mining amber, which occurs in blue-green earth easily distinguished as the dark strata beneath steam shovel at left above.

by HANS F. KUTSCHBACH

"Baltic Gold" isn't a metal at all, but is the name usually applied to amber because of its rich golden color. Genuine amber is fossilized pine-tree resin, and is found only in one spot in all the world.

The little town of Palmnicken, shown on map, is the site of mines from which the world's genuine amber is recovered 25 feet beneath the sea level.

THE little village of Palmnicken, on the shores of the Baltic Sea in East Prussia, can well lay claim to the title of the Klondike of Germany. Here is the only region in the world where Baltic gold is mined, dug up from a blue earth strata 25 feet beneath the level of the Baltic sea.

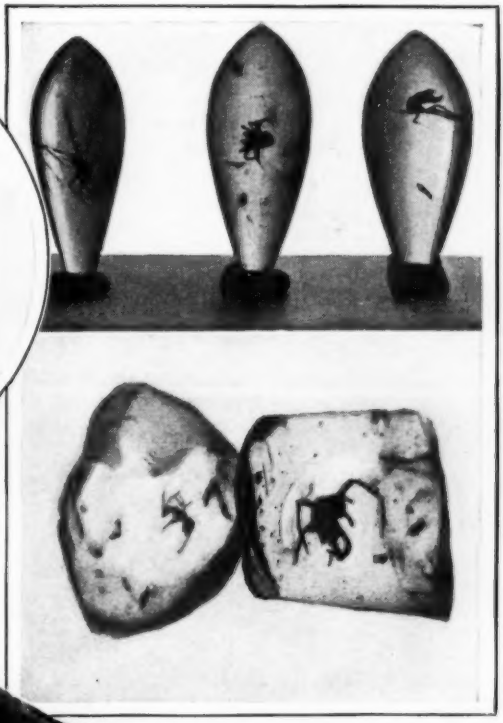
Baltic gold really isn't gold at all, but amber—that beautiful gem substance with the look of sheer gold, which is the fossilized resin of enormous pine forests which flourished thousands of years ago, before the last ice age. Geologists conclude that these forests were submerged during the tertiary period. In those ancient times the trees were injured by numerous insects and by the rough climate, so that an unusually large discharge of resin took place.

This resin, or pitch, collected on the bark of the trees, and when the forests were buried became petrified. Striking proof that amber was at one time a sticky, semi-liquid substance is found in the large pieces of it frequently unearthed which contain spiders, flies, ants, and other insects imbedded in the center, telling a mute story of their being trapped like houseflies on a sheet of sticky fly paper. Such specimens of amber are particularly valuable, and are cut into ornamental shapes which display the insect in its beautiful tomb to best advantage.

Amber is obtained in two ways—through

25 Feet Under Sea

Amber is harder than most resins and not brittle, so that it can be carved easily into ornamental articles like the Buddhist statue above and the lion below.



Insects imbedded in pieces of amber. Thousands of years ago they were entangled in sticky pine pitch which became fossilized into solid amber.

open pit mining in which the amber-bearing strata is worked by steam shovels, working 25 feet beneath the sea level (though far enough back from the shore so there is no danger of their being submerged) and through "fishing." In the latter operation, men with nets patrol the sea shore and retrieve chunks of amber thrown up by the action of the waves.

A cubic yard of blue earth yields about four pounds of amber. After being mined, it is carefully washed and sorted. There are fully 250 different grades of amber, varying in clearness from transparent to cloudy. There are also differences in texture, some varieties being more brittle than others. Amber is just hard enough so that the fingernail cannot scratch it. Genuine amber is produced only from the Baltic diggings. Imitations of it are usually easy to distinguish, since the real amber is light and floats on the surface of a salt-saturated solution of water, while the spurious product sinks to the bottom. More than a million pounds of amber a year finds its way to the hands of dealers, who manufacture it mostly into ornaments and works of art.

Smaller pieces of amber, unsuited for jewelry, are utilized in the manufacture of pressed amber, which is identical with natural amber in all respects. The small chunks are ground up and compressed under high temperatures into bars, sheets, and shaped forms. No binding material is used

Chunks of Amber Washed Ashore by Waves, Recovered by Fishermen

Amber, which floats in salt water, is often washed ashore by waves which loosen it from the sea bottom. Men with nets salvage it, as shown in the photo above.

Newly mined amber being washed free of earth. Four pounds of amber is recovered from a cubic yard of earth.

in this process, heat alone being employed.

The annual output of pressed amber now amounts to 25,000 pounds. It has a clear yellow appearance, similar to that of honey. Yellow, incidentally, is the only color found in amber, though there are a great number of different shades of this underlying hue, ranging from palest yellow to brown. Pressed amber is much used industrially, particularly in the field of electricity, where its properties as an insulator are greatly valued.

The ancient Greeks had a knowledge of amber and were familiar with its property of becoming charged with negative electricity when rubbed on fabric. Indeed, there are old documents in existence which license enterprising traders from the Baltic area to carry on an amber trade with the Egyptians and Greeks.

A metal-ware industry has developed side-by-side with the business of amber mining, for the reason that ornaments made of precious stones require settings of gold or silver before they are acceptable as jewelry. Before the war amber products were not very well known in Germany, their sale at that time being chiefly confined to summer resorts where they were bought up by foreign visitors. During the war, when gold and silver could not be obtained, jewelers turned their attention to amber and employed it as a substitute for other gift articles.

One of the most interesting physical properties of amber is the fact that it cannot be wet by blood or other fluids. The fact that it is not brittle, being perfectly amorphous without any suggestion of crystalline form, makes it an easy substance for the carver to work with.

The imitation of amber which has had the widest commercial acceptance is the substance known as Bakelite, the invention of an American chemist, Dr. L. H. Baekeland. Bakelite is produced from carbolic acid, formaldehyde, and salt.

MOTOR MECHANICS

Edited by RAY F. KUNS

Each month the editor of this department gives you pointers on keeping your car in shape. This month, among other things, he tells you how to turn the sedan into a comfortable double bed for use in camping out during your summer motor tours.

Why Not Sleep in the Car This Summer?

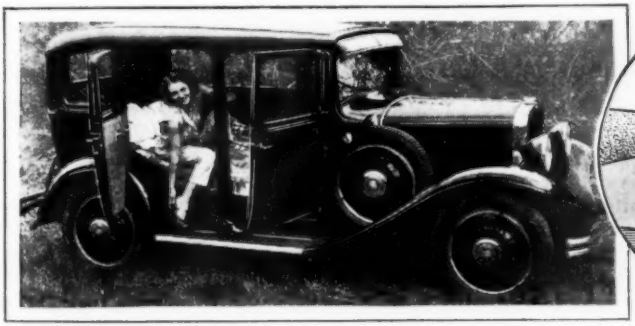
SOME car manufacturers are turning out sedans arranged for the lowering of the back of the front seat and the rearrangement of the cushions to provide a very comfortable bed. However, there are many cars in the hands of owners who would like to have them provided with a similar arrangement.

The sketches reproduced herewith suggest a method of doing this.

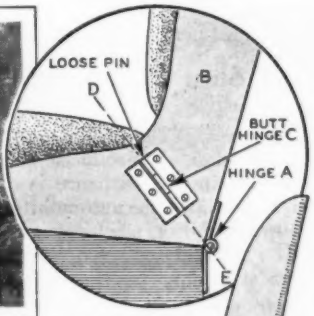
It is necessary to give some thought to the dimensions of the parts which are to be arranged for a bed. That is, it is necessary to figure the point at which the hinge A, is to be placed so as to have just the right amount of distance in the part B, which is to be folded down, as shown in the lower part of the sketch. This part is ordinarily supported by means of a wood block.

A loose pin hinge is installed as shown. It will be necessary to cut the seat metal on a line approximately that shown as DE. The loose pin butt hinge is installed to take care of the strain induced after this cut is made. By removing the pin from the hinge it is possible to drop the back down as shown. Two of these hinges are required, one for either end of the seat, also two of the hinges A, for the part which drops down.

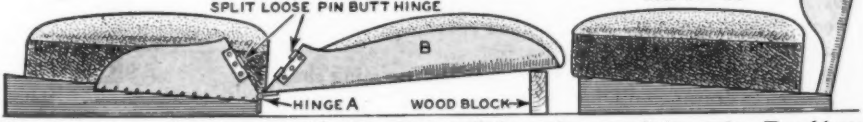
By turning the front and rear cushions around and giving some thought to the position of B, it is possible to arrange a very comfortable bed. Certain spaces which are not level may be filled in with blankets or a piece of duck may be carried which is stretched snugly over the entire cushions.



The Dodge sedan is equipped for sleeping in much the same manner as described here. You can easily do the same with your automobile.

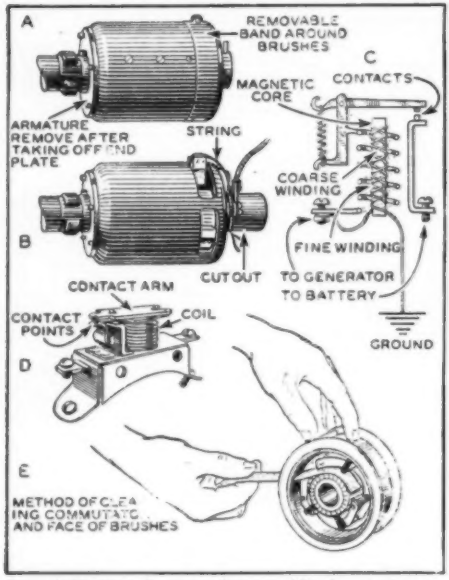


The back of the front seat is sawed at the line D—E.



After the cut is made a loose pin butt hinge is installed to take care of the strain. Two hinges are also placed at A, and the back is supported with a wood block. Blankets may be used to fill the hollows.

Pointers on Repairing the Auto Generator and Cut-Out



A and B show how to disassemble the generator. D is an assembled view of a typical cut-out.

WHEN the ammeter fails to indicate charge, with engine running at fair speed, precautions should be taken to safeguard the generator. Old style generators have a terminal for connecting to the cut-out. A wire should be connected to this and secured solidly to some metal part of the engine or frame.

In recent generators a procedure as shown by the drawing is serviceable to prevent the generation of current. The metal band is removed and one of the brushes is lifted out of contact with the armature and held raised by tying with a string.

It is possible to disassemble a generator so that it may be inspected for breaks in connections. The wires leading from the brushes to the field coils should be detached at the brushes. The end plate should be loosened so that the armature can be slid out. Frequently a wire in the armature coil will be unsoldered at the copper segments of the brush end of the armature. In the field coils the most likely break is in either of the unsupported wires connecting to the brushes. A drop of solder may save a ten dollar repair bill.

If the generator is charging at a high rate or the battery becomes disconnected due to breakage of the ground connection, excess current is quite likely to heat and burn the fine winding connections.

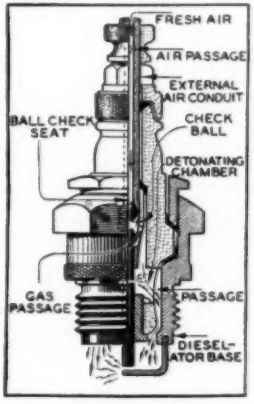
If the generator brushes show sparking when a ground wire is fastened from the generator terminal to the engine, it indicates the generator is working, and the cut-out is faulty. The cut-out should be removed and carefully inspected. If the soldered connections have melted, this will show under close observation. A dry cell and a small light can also be used to test the cut-out connections. It will be frequently found that a drop of solder will repair a cut-out and place it in good working order.

Twin Shot Dieselator Gives Diesel Performance in a Gasoline Engine

THE "Twin Shot Dieselator," recently patented by E. R. Holmes, of Denver, has been perfected to a point of mechanical precision. It produces a capable ignition system whereby Diesel engine performance is obtained in the gasoline engine—more especially, the automobile, airplane and motor boat engines, where reliability, efficiency and economy are very essential.

The "Dieselator" projects intensive ignition into a gaseous body at widely separated points within the engine cylinder, thereby obtaining complete combustion of the fuel used, producing dual ignition with only one timer and one distributor. At the proper moment, two intensified balls of electric flame, each several times larger and hotter than a single spark, occur simultaneously at widely separate points within the cylinder, completely consuming any carbon, oil or other substances that might collect at the electrode gap.

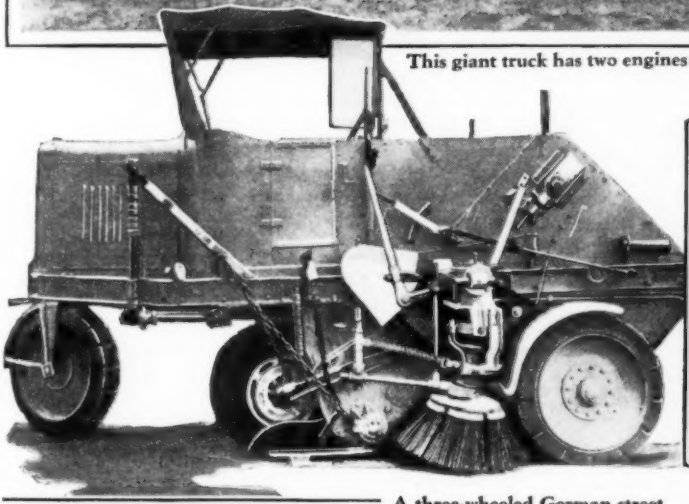
In the center of the dieselator body is a small detonating chamber into which is drawn a volume of fresh air charged with a portion of fuel from the cylinder. Then, by reason of its shape, high compression is created.



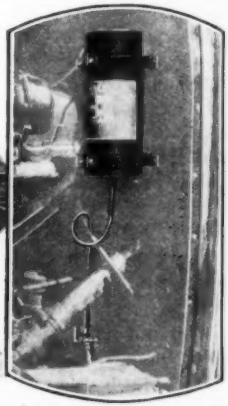
A cutaway drawing of a twin shot dieselator plug.

Latest Automotive Inventions

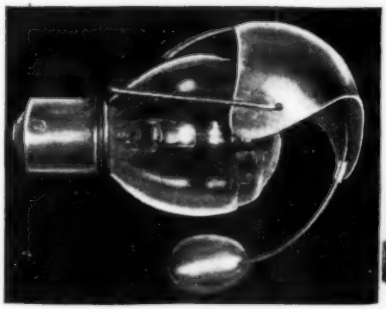
This giant truck has two engines of 275 horsepower each.



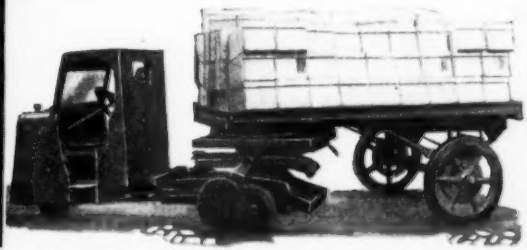
A three-wheeled German street sweeper which collects refuse in a container, is shown above.



An emergency gas tank carried under the hood.

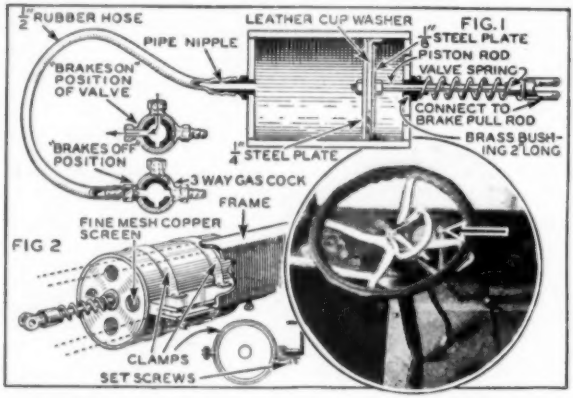


This automatic glare shield for auto headlights adjusts itself, without human aid, to prevent glare when the car is going up or down hill. The pendulum does the trick.



The growing traffic in London has caused horses to be barred from many streets. But an ingenious mechanical horse which does the work without taking up the room has recently made its appearance in the crowded wholesale districts. This "horse" has shown itself capable of hauling a three-ton load at a speed of 18 miles an hour.

Making a Vacuum Brake With Manual Control for Autos



Construction details of a home-made vacuum brake control. The 3-way valve is connected to the engine manifold by ½" rubber hose or copper tubing. The ends of the cylinder are threaded to receive the cylinder heads. The inset shows where the control quadrant is mounted.

THE vacuum brake is a device which is designed to be operated by the suction of the engine. All that is necessary, if the force developed by the engine vacuum is to be put to work, is to place a cylinder in connection with the brake rigging in such a manner that when the valve is opened and the air drawn out of the cylinder the piston travels in and sets the brakes.

The brake shown is designed for hand operation. The three way valve is controlled by a gas lever on the conventional type of control quadrant mounted just back of and under the steering wheel.

The cylinder is made from seamless drawn steel tubing. The cylinder heads are turned to size and threaded to screw into the ends of the cylinder. The rear end of the cylinder has a bronze bushing fitted to act as a guide for the ½" cold rolled piston rod. Air holes are drilled into this head. They may be made an inch or more in diameter and have a fine mesh screen soldered over them for protection against grit.

The forward end of the cylinder has a ½" pipe nipple fitted to it and this in turn is connected to one side of the valve by means of the necessary length of ½" garden hose. The valve must be located under the floor boards at a position convenient to the valve control rod. The other side of the valve is then connected to the intake manifold of the engine in a similar manner. When drilling the manifold for the connection, keep as close to the carburetor as possible and at the center of the manifold.

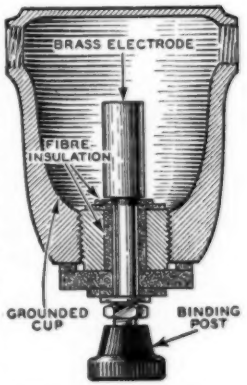
The three way valve is a tapered pin gas cock. Free this up until it turns readily and set the lock nut so that it may not be displaced by road vibration. A quarter turn of the valve sets the brakes or releases them.

The cylinder may be mounted at any point, where it is convenient, to have it in line with the brake pull rod. It is not necessary to increase the pull with levers. It is necessary to have a slip joint so that when the brakes are applied by pedal pressure there will be no need of forcing the piston head in the cylinder. The cylinder may be clamped to a bar of metal, as shown in the illustration, by means of two sets of strap iron clamps. The metal bar is slotted on the miller or the shaper. Cup-end set screws lock it to the car frame.

This device does not interfere with the normal foot pedal braking action of the car in any way. When using the vacuum brake the foot pedal travels in its normal way. When setting the brake the carburetor mixture is disturbed for an instant, but this is of no great concern.

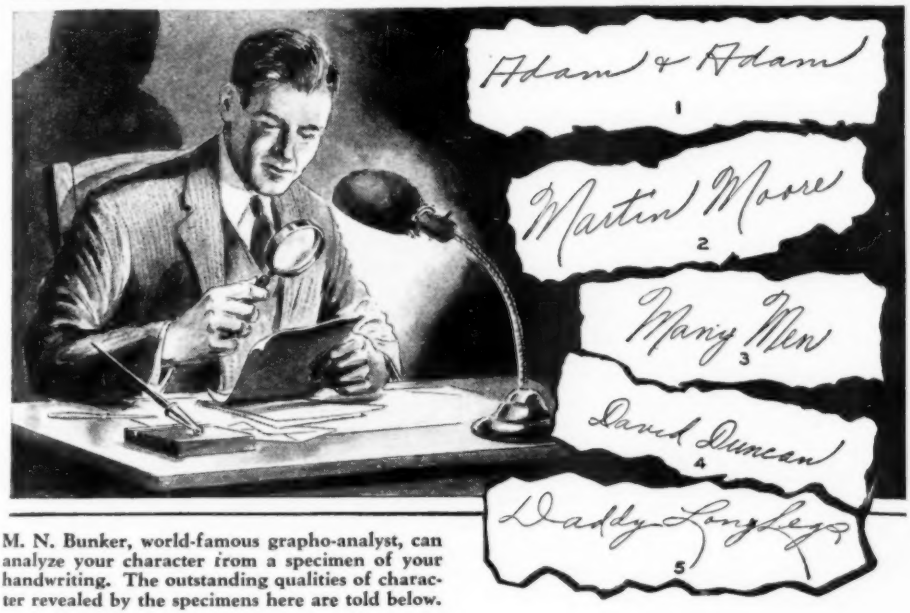
Oilator Removes Water From Oil

REMOVING water from motor oil by the process of electrolysis is the task performed by a device recently invented. When water from the oil gets into the trap an electrical circuit between a brass electrode in the center and the grounded cup is completed, causing the undesirable liquid to pass off as a gas.



When water gets into this trap it passes off as gas through the oil lines.

Free ANALYSIS of Your Handwriting



M. N. Bunker, world-famous grapho-analyst, can analyze your character from a specimen of your handwriting. The outstanding qualities of character revealed by the specimens here are told below.

M. N. BUNKER, world-famous grapho-analyst, has found from exhaustive study of handwriting that capital letters share with the small letters in their expression of the talents and character of the writer.

When you find a specimen of writing with the capital "A's" made as in specimen No. 1 in the list above, you may look for an artist or builder. The writer may lack training in any such field, but there is an unconscious desire for creative work.

A capital "M" that is written with the last section higher than its mates is certain evidence of self-consciousness. Such a writer will worry about what other people think, will be quick to blush and stammer, and if accused of anything will be much more likely to look and act guilty than to do otherwise. In such a case actions, though speaking louder than words, will be deceptive.

If the "M" is crowded together as in specimen No. 3, the writer is not only self-conscious but very timid, shrinking back from the strange or unusual. There are men and women who go through life handicapped in everything they do by this trait of fearing that someone will look at them or criticise them, all entirely without reason for that fear.

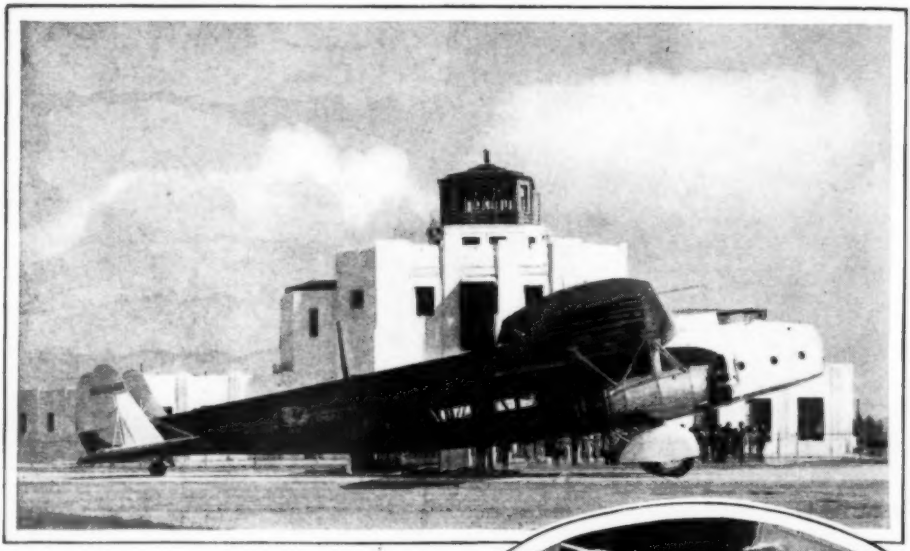
Your writers who make their capital "D's" narrow and closed are much more content to know a few people well than to go out and fight for social leadership. They may know many people in a general way, but after all only a few people ever really know such writers.

On the other hand the man or woman who makes an open-topped capital "D" is likely to be a good mixer, will know many people, and is usually a good salesman. They know how to present ideas, express themselves clearly, and will influence their hearers in proportion to their earnestness and strength of will.

There is no doubt though but that they will get a hearing in many places where the closed-D writer would not have a chance. They will get on in the world because of their boldness, enterprise, and attractive geniality.

Your latent powers and talents, as revealed by your handwriting, will be analyzed for you free if you will send a stamped, self-addressed envelope, together with a specimen of your handwriting, to M. N. Bunker, care of Modern Mechanics and Inventions, 529 So. 7th St., Minneapolis, Minn.

Radiophone Increases Safety



A 32-passenger air liner of the Western Air Express in front of the Alhambra Station. Note aerial strung from the wings to the fuselage mast.

by JOHN EDWIN HOGG

IF YOU lived within range of the radio station at the Alhambra airport, the plane terminal for Los Angeles, you might tune down to 100 meters on your radio receiver and hear something like this:

"Alhambra calling ship 55. Answer please."

A voice that sounds considerably farther away, but easily audible and distinct, would next be heard.

"This is ship 55 answering Alhambra. Pilot Carson speaking."

The conversation that follows is like a confab between spooks. "What is your position, Carson?" asks the dispatcher. A dim droning of an airplane's engines comes through the air with the pilot's voice, but above the noise we hear clearly: "My altitude is 8,000 feet. My position is L 9. I'm five miles north of beacon 27. Visibility over the desert is perfect, but from the Sierra Madre mountains to the ocean I can't see anything but fog."

"There's five hundred feet of good visibility under the fog here in the San Gabriel

Dr. Lee DeForest and Herbert Hoover, Jr., who are literally father and son of the present system of radio telephony used in commercial aviation.

Valley," replies the dispatcher. "Come on in. Keep above the clouds and we'll listen for you."

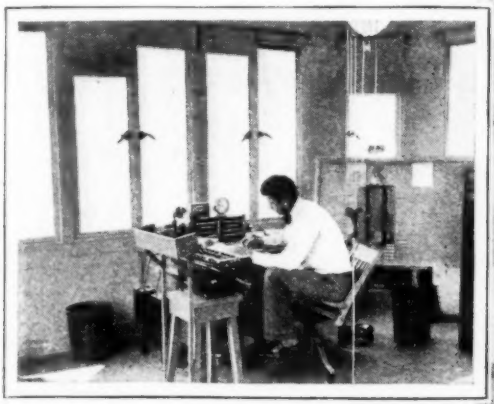
There is some twenty minutes of silence, and then the drone of the airplane can be heard in the air above the dispatcher's office, which is situated in the tower overlooking the million dollar airport of the Western Air Express.

"All right, Carson, you're right over the middle of the field now," says the dispatcher. "Come on down. The coast is clear. No other planes are in the vicinity. Alhambra signing off with ship 55."

In a few minutes an airplane roars down

# of FLYING

Thanks to the radio telephone developed for use by airplanes in experiments conducted by Herbert Hoover, Jr., pilots on all modern air lines can now learn every fifteen minutes the exact condition of the weather along their routes.



The dispatcher's desk in the tower of the Alhambra airport terminal. The radiophone keeps him in direct contact with various planes at all times.

out of the fog, sailing over house tops and trees towards the airport. Its lights dip gracefully, and it is down—safely on the aviation field. The radio telephone has removed the danger from an airplane landing that would have been extremely hazardous a year ago.

Similar conversations between pilots in the air and the various Western Air Express fields are to be heard during almost any hour of the day or night. The ships may be moving between Alhambra and Kansas City, to and from Salt Lake City, Agua Caliente, Mexico, San Francisco, El Paso, Dallas, or over any of the air lines that radiate from Alhambra like the spokes of a half wheel.

Herbert Hoover, Jr., son of the nation's chief executive, is chief engineer of the Western Air Express radio service, and is directly in charge of communications. For the past year he and his staff of radio-trained assistants have been at work conducting a series of experiments that have made radio and aviation history.

Sitting at his desk before a microphone, the operator can warn passenger or mail plane pilot of severe storms or direct landing operations. The above drawing shows the hookup with which signals are transmitted to and received from the pilot.

This photo, showing the Indian-Pueblo town of Ancoma, N. M., gives an idea of some of the territory covered by air routes. The town now has a radio station for receiving plane positions and transmitting the necessary weather data.

Co-pilot Gil D. Clark using typical plane equipment to talk with Alhambra station from a 32-passenger Western Express plane in flight.

As a result of his labors every plane of the Western Air Express is now equipped with two-way radio telephones. The whereabouts of every airplane in the company's vast network of western air lines is known during every minute of their flights. Every pilot of the various lines, while in the air, is constantly within "speaking distance" of his home airport, of weather stations, and of terminals, and intermediate fields. If another plane of the Western Air Express is ever forced down, every office of the entire system would know about it almost instantly. They would know almost the exact spot at which such a ship makes contact with the ground. Gone are the days of the "needle-in-the-haystack-hunts" for aviators "down in the rough", as in the case of Maurice Graham, famous mail pilot.

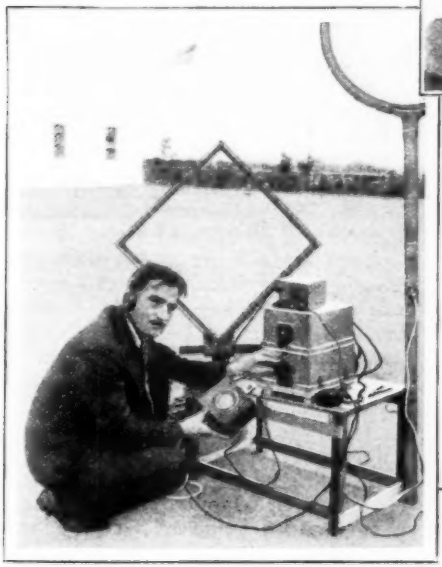
Finding and rendering assistance to the radio telephone-equipped airplane is placed in the class with answering the "S. O. S." call of an ocean ship, with her latitude and longitude known to the rescue ships. Radio telephony gives aviation an entirely new set of values for weather science. The danger of collision between airplanes in the air is virtually eliminated. Pilots are no longer forced to rely wholly upon their own judgment, and aerial passengers are given a new sense of security in the safety and reliability of modern air line service.

A transport pilot has plenty to occupy his time and attention when in the air. Thus, out of necessity, conversations with the dispatcher are rendered in the simplest possible terms. The pilot, in reporting his position as "L 9", is using a code language developed

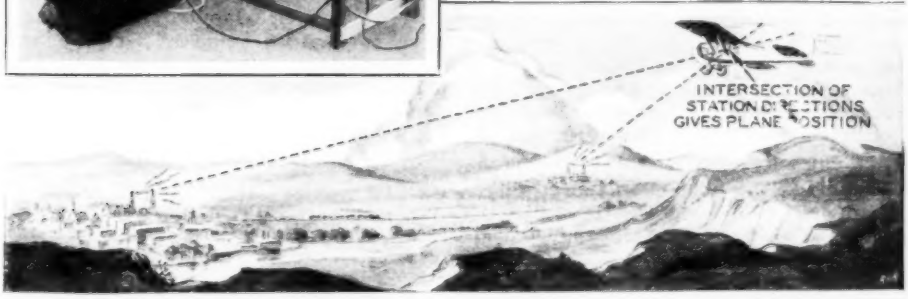
for the purpose. The maps of the air routes are all divided up into squares, and these squares are designated in the manner of a city map. Alphabetic letters indicate distances on the map north and south, and the numbers represent distances east and west. Thus, when a pilot reports his position as "K 4", "G 2", "B 14", or whatever the designation may be, the location is as definite to the dispatcher as if the pilot were present, and pointing out a location on a map on the wall. The beacon lights are all designated by number, and flash their own identifications to pilots in the air. This gives a very definite location when a pilot reports in to say that he is five miles north of beacon 27.

Tremendously increased value to the science of aerography is given to aviation by the development of two-way radio telephony. All pilots of the Western Air Express receive their weather reports every fifteen minutes. Every detail of every weather condition along their routes of flight is revealed to pilots in the air almost as fast as such weather conditions are known to the aerographers at the various ground stations. It is no longer possible for a pilot to fly blindly into adverse weather conditions. He is warned of dangerous storms, and if the circumstances

Air mail pilots are equipped with the specially devised radio helmet shown above. Both microphone and ear phones are designed to shut out motor noises, and are connected with the set by a special plug.

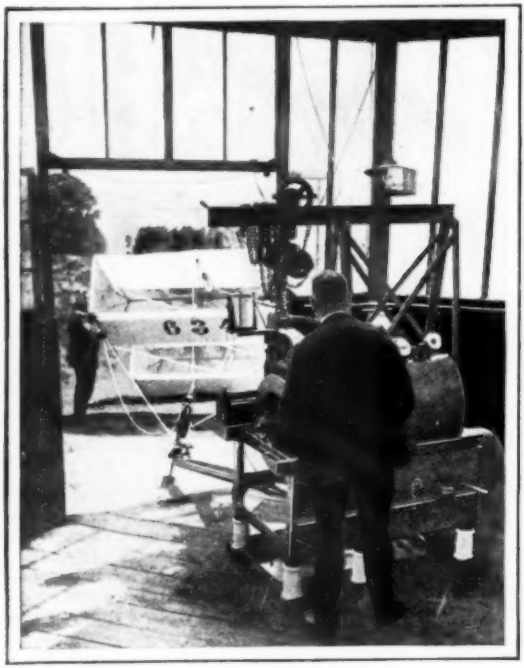


Maurice Graham, a veteran pilot, whose death in a crash stimulated radiophone experiments.



By means of a new radio compass, or "direction finder," perfected by a Los Angeles radio engineer, L. G. Kreusi, shown in above photo, pilots can determine their positions by taking bearings on broadcast stations. The intersecting point of the direction of the signals gives the position of the plane.

Velocity of Air at High Altitudes Is Now Measured With Huge Kites



Meteorologists are now using mammoth kites for determining the velocity of the wind at high altitudes. The force of the pull on the string is recorded on the graph, above.

warrant it, he sets his ship down to avoid disaster.

While radio telephony would now make it possible for Western Air Express pilots to be at all times subject to the orders of officials of the company, no such orders are ever given to a pilot in the air. The company employs only such pilots as are capable of taking complete command of a ship. Each pilot is considered to have the same authority that a captain has on a ship at sea. The company may advise him, warn him of dangerous weather, or talk to him at all times, as the traffic manager might talk to him in the home office. But all decisions concerning "set downs" for bad weather, emergency landings and similar things, are left exclusively to the pilot's judgment after he is advised of conditions by radiophone. He alone is the man responsible.

Innumerable incidents might be cited to prove the incalculable boon that radio telephony has been to pilots of the Western Air Express. Not long ago, Pilot Klotz, coming into Alhambra from Salt Lake City with the night air mail, was warned of a fog condition that temporarily rendered a safe landing virtually impossible at the local field. A neighboring airport was free from fog at the time, and Klotz was directed to it by radio phone. The mail truck was sent to the field in advance of his landing at the other field. Thus the radio telephone not only made it possible for the pilot to land without danger, but also avoided delay in the mails.

Again, very recently, Pilot Bert Cox, coming into Los Angeles with a load of passengers from San Francisco, encountered a storm condition that he regarded as dangerous. Without radio communication he'd have had no alternative but to set his ship down at the nearest emergency airport. But by calling the Alhambra dispatcher on the radio telephone he was promptly given instructions for flying around the storm. He arrived on schedule with perfect safety, and to the company's credit for maintaining dependable service.

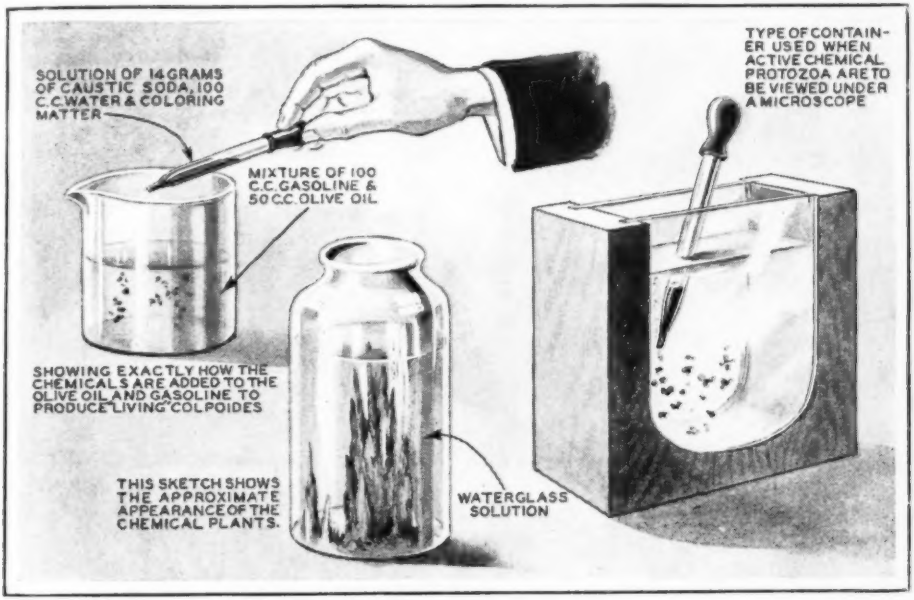
The radio telephone is a tremendous convenience to the relatives and friends of passengers traveling by air. Persons who desire to meet passengers at the various air terminals have only to call the terminal by telephone to receive detailed information concerning the location of the plane and the time at which it will arrive.

Along its various air lines the Western Air Express maintains a number of so-called flag stops. These are points at which air liners do not regularly stop, but where stops will be made to pick up passengers or to set them down. Smoke signals and flares were formerly employed to bring a pilot out of the sky, but radio telephone now eliminates such primitive methods. Pilots receive instructions by radio whenever there are passengers waiting to be picked up at intermediate ports.

In the traffic tower at the Alhambra airport, the handling of aerial traffic is now in the hands of a former railroad dispatcher, Mr. A. C. Hall. The mechanics of air line dispatching are precisely the same as those long in use in railroading, with certain modifications made for different demands. The former railroad dispatcher is employed for his technical knowledge of the subject, but

(Continued on page 189)

Creating Artificial Life from Chemicals


SOLUTION OF 14 GRAMS OF CAUSTIC SODA, 100 C.C. WATER & COLORING MATTER
MIXTURE OF 100 C.C. GASOLINE & 50 C.C. OLIVE OIL
SHOWING EXACTLY HOW THE CHEMICALS ARE ADDED TO THE OLIVE OIL AND GASOLINE TO PRODUCE LIVING COLPOIDES
THIS SKETCH SHOWS THE APPROXIMATE APPEARANCE OF THE CHEMICAL PLANTS.
WATERGLASS SOLUTION
TYPE OF CONTAINER USED WHEN ACTIVE CHEMICAL PROTOZOA ARE TO BE VIEWED UNDER A MICROSCOPE

The amazing little colpoides are created by adding the solution of caustic soda, water, and coloring matter to the mixture of olive oil and gasoline as shown. The colorful chemical plants are formed by dropping crystals of cobalt chloride or cupric sulphate in the water and waterglass solution.

HOW would you like to create some amazing little creatures called "colpoides?" That's the name given to certain peculiar chemical protozoa by Dr. Alfonso L. Herrera, Director of the Biological Institute of Mexico City. He claims that they represent the first step toward producing real life in the laboratory. Whether that be true or not, however, the experiment is extremely interesting to conduct. Any amateur chemist can perform it easily.

Place a porcelain plate or dish in a photographic developing pan, or any other similar container. Dissolve 100 centimeters of pure gasoline (no treated gasoline will do) with 50 centimeters of pure olive oil. Now, into this solution drop a mixture of 14 grams of caustic soda, 100 centimeters of warm water, and one gram of any coloring matter. This is accomplished best with a medicine dropper. The result will be the production of imperfect, artificial beings, which, nevertheless, display many of the characteristics of living protozoa.

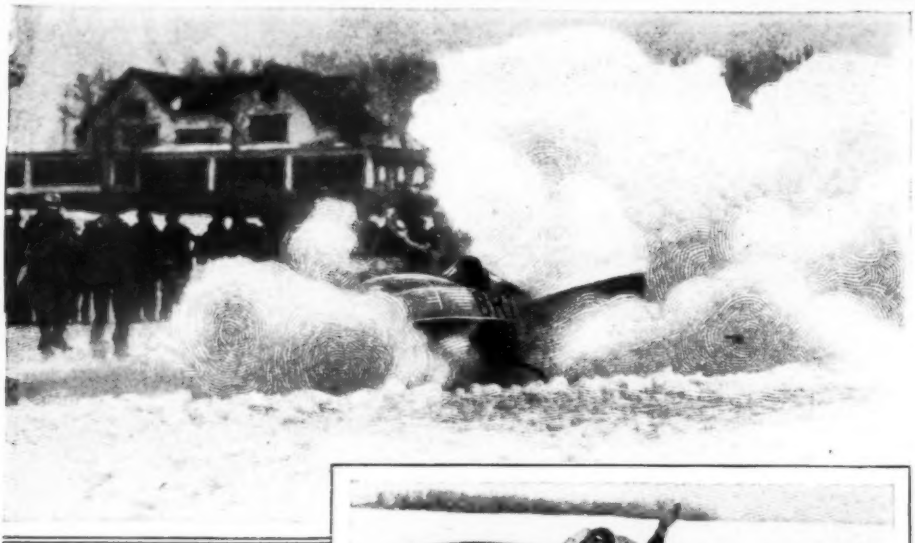
These "colpoides" will cease functioning after two or three hours, but if one focuses the sunlight coming through a magnifying glass on the little creatures, they will become re-animated.

In working with this experiment, you will find that the addition of gum arabic will produce imitation beings, which are able to grow and to multiply by fission, sometimes dividing as many as five times in two hours. Also, if you add a bit more soda, colored differently for better observation, you will notice that the colpoides extend themselves to suck it in. Although this effect is produced by a simple physical action, the equilibration of osmotic pressure, it is very uncanny to watch.

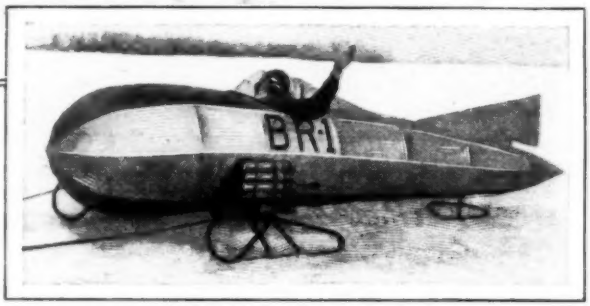
Observed under a microscope, still greater marvels appear. The little creatures seem to fight among themselves, often becoming so ferocious that they devour each other, much like tiny cannibals! They move about with apparent ease, and seem to be forever dissatisfied with their shapes, for they constantly break up, reform, and some become filled with little vacuoles. In truth, their antics are

(Continued on page 188)

Rocket Driven Ice Sled Speeds Over Lake at 75 M. P. H.



The new rocket sled designed and built by Harry W. Bull, of Syracuse, starting out in a flash of smoke in a test on the ice of Oneida Lake.



Rockets which propel the sled are attached to the sides of the fabric covered fuselage just above steel runners, as shown here.

PROPELLED by the fiery explosions of eighteen rockets, a new torpedo shaped ice boat, designed and built by Harry W. Bull, 21-year-old Syracuse University student, proved itself in a recent test an extremely speedy vehicle, capable of acceleration at a rate of 110 feet per second, or about 75 miles per hour—four times faster than that of the average auto.

Bull's novel craft, streamlined to reduce wind resistance to a minimum, is steered by means of an airplane rudder, which is controlled from a rudder bar by the driver in the cockpit. The eighteen rockets, made of strong cardboard tubes packed with ordinary powder, are attached to the sides of the fuselage and are set off by a spark from wires running to the control board in the cockpit.

The framework of the fuselage is of band iron trussed with wire, over which is stretched airplane wing fabric. Two steel runners ten feet apart support the front of the craft, while a third is placed at the rear. In the recent test, the sled lit out in a blinding flash of smoke to attain a 50 foot run.

Worms Spin More Silk by Radio

EVEN silkworms work better to radio, it has been discovered by two Italian biologists. The radio waves were not those used in broadcasting but the so-called ultra-short waves between two and three meters long, like the waves now being used to create fever in the bodies of men and animals.

Taking a batch of silkworms fifteen days after hatching from the egg, the Italian experimenters exposed these worms for thirty minutes each day to the radiation from a powerful generator of these ultra-short waves. The radiated worms grew faster both in length and weight, it was found, than did worms which had no radio. Also, the radio worms began to spin their silken cocoons sooner and produced an appreciably higher average of silk.

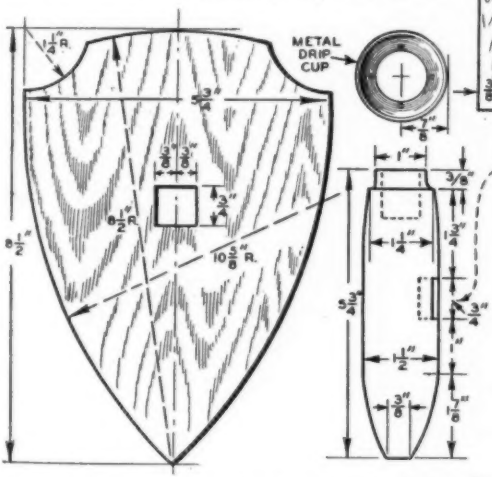
Things to Make with Tools

Edited by A. NEELY HALL

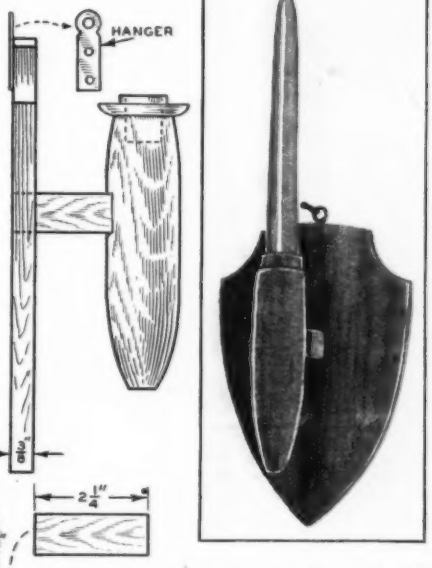
Sconces to Ornament Walls of Your Room

Clear, easily understood plans for building sturdy, serviceable articles for your home, your workshop, or the playground—that's what you'll find in this Home Workbench Department, which is edited by a craftsman who is an authority in his field—A. Neely Hall.

A PAIR of sconces like the one illustrated in the accompanying photo and drawings are just the thing to hang on either side of a picture, a doorway or a window in your room. Done in bright lacquer or enamel, or in a two-color combination, they will be especially becoming in a home with modern furnishings.



Here are dimensions for backboard and candle stick of the sconce. Note that the curves of the tops and sides are true arcs of circles.



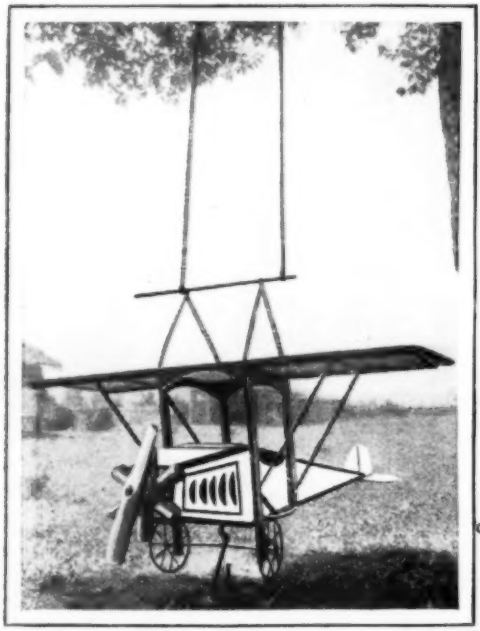
Above photo shows completed sconce, which is attached to wall by means of hanger at top.

The backboard is cut from ⅜ inch plywood, using the pattern shown in the drawing above. Note that the curves of the top and sides are true arcs of circles. The mortise for holding the candle stick bracket is bored first with a ¾ in. drill, then chiseled out square as shown.

Cut the candle stick from a round rug pole or a curtain pole 1½ in. in diameter. Bore a ¾ in. hole in the top to hold the candle, then taper the end of the piece with a plane or woodrasp, as illustrated in the drawings. Then cut a mortise in the side about ¾ in. deep and ¾ in. square to take the bracket block. This bracket block is finally glued into the mortises on both the backboard and the candle holder.

The drip cup should be cut from 19 gauge copper into the form of a disk 1¾ in. in diameter, and beat into a bowl shape with a ball pein hammer. Then cut out the center to fit the shoulder and secure the cup in place with small brads.

An Airplane Swing



Suspended from a tree branch by means of the pipe strap hangers, the plane is swung back and forth by operating a pipe "stick" joined loosely to a stationary ground pipe.

Swinging back and forth in this miniature plane, youngsters can duplicate in imagination all the feats of world famous aviators—all with absolute safety, of course. The swing is easy to build and will make a very fine addition to any playground.

NOTHING that you might make for a lively child will please him half as much as a swing built to look like an airplane. In imagination he will duplicate the great flights he has heard tell about; yes, surpass them with a flight to the moon. He will break this and that record and, but for "refueling," he might pay little heed to meal and bedtime signals. He will develop air-mindedness, surely.

The pipe and pipe-fitting stick, with ground connection, is well suited to a swing for a young child, as it makes it possible for him to keep the swing in motion, at the same time giving him beneficial arm and back exercise.

You will get the idea of the assembly from the accompanying drawings. The fuselage framework is built of 2-by-2s, as illustrated in Fig. 2. Build a pair of side frames like that shown. Then connect them with strips set in between the longerons. The plan shows the distances between the side frames. Make the nose frame of the dimensions given in Fig. 2, and connect it to the fuselage framework with longeron strips about 16 inches long, with ends beveled to fit squarely. When you have completed the framework assembly, cut away the upper longerons as indicated to provide for the curved cockpit coaming.

Cover the fuselage framework with sheet metal such as galvanized iron, or with heavy building paper. Cut the pieces to fit, punch their edges for nailing, and fasten with common nails. Curve the edges of the cockpit cowling and coaming, as shown in Fig. 1.

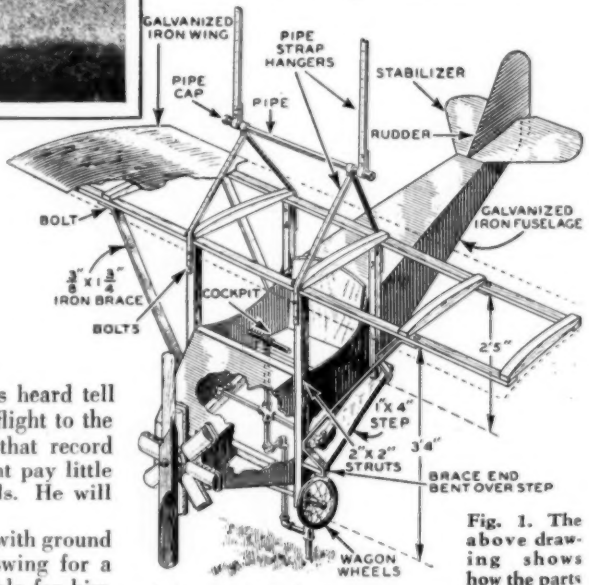


Fig. 1. The above drawing shows how the parts of the novel airplane swing are assembled. Note the position of the pipe "stick" in the cockpit.

for Air-minded Youths

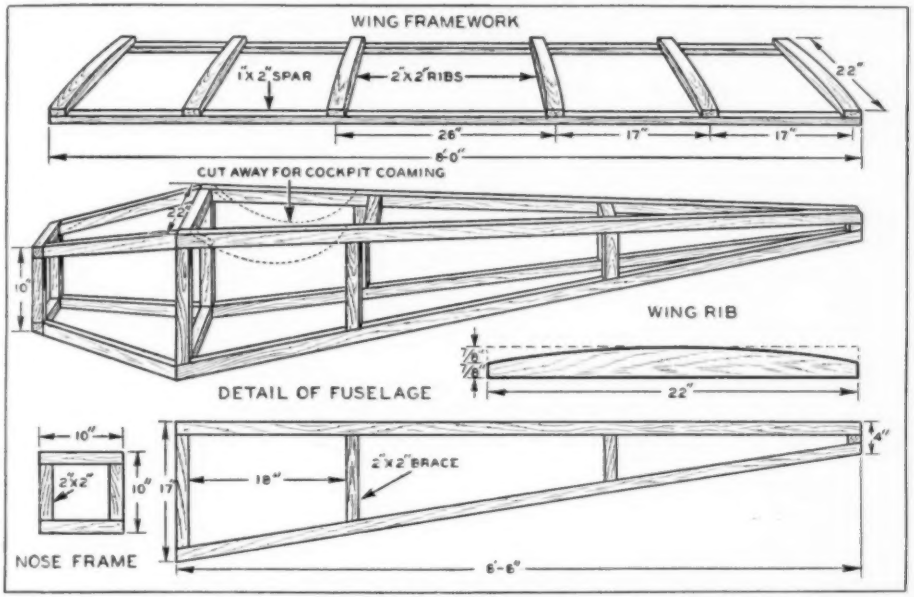


Fig. 2. Here are plans for the wing framework and fuselage of the swing. A section of the longerons is cut away as shown for the cockpit coaming. Both wing and fuselage are covered with sheet iron.

Next comes the wing. Figure 2 shows a framework detail. The spars are of 1-by-2 stock, the ribs of 2-by-2 stock. Cover the wing framework also with sheet metal, cutting pieces 27 inches wide, to make a projection of 2½ inches over the sides of the framework.

The wing struts are of 2-by-2 stock, cut to lengths given in Fig. 1 and bolted to the fuselage. Fasten the wing to their tops. Brace the wing ends with the pairs of iron braces and bolts as shown in Fig. 1. Make the step of a 1-by-4 board, and fasten it to the side of the fuselage, as shown.

Make the stabilizer of sheet metal. Cut it to the shape and size given in Fig. 3 and nail it to the fuselage. The pattern of the rudder, given also in Fig. 3, is of the shape of one-half of the stabilizer. Slash the lower edge, as shown, to form lugs for fastening the rudder to the fuselage. Bend up the lugs, one to the left, the next to the right, and so on. Punch nail holes through the lugs, then drive nails through them and the stabilizer into the fuselage framework.

Figure 3 shows a front view of the motor cylinders. The bases are boards 3½ inches wide, notched on their edges, and the cylinders are blocks shaped half round. Complete the nose with two wooden disks 5 and 6½ inches in diameter. Center them and nail them to the fuselage.

The propeller is carved out of a piece of 2-by-4 27 inches long, as shown in Fig. 3. Shape the blades with a drawknife, and smooth them with a plane and sandpaper. Bore a ¾-inch hole through the hub center to admit the shaft. Make the propeller shaft of a ½-inch pipe nipple 3 inches long. Screw one end of the nipple into a floor flange, and bolt the flange to the center of the nose. Slip the propeller onto the nipple, and screw on a pipe cap to hold it in place.

Now for the landing gear. Get a pair of wagon or baby carriage wheels and an axle. Bore holes through the lower ends of the front wing struts, slip the wheel axle through the holes, and attach the wheels.

The pipe and pipe fittings assembly of the stick is shown in detail in Fig. 3. This rig,

Push-Pulling "Stick" Handle Causes Airplane to Swing Back and Forth

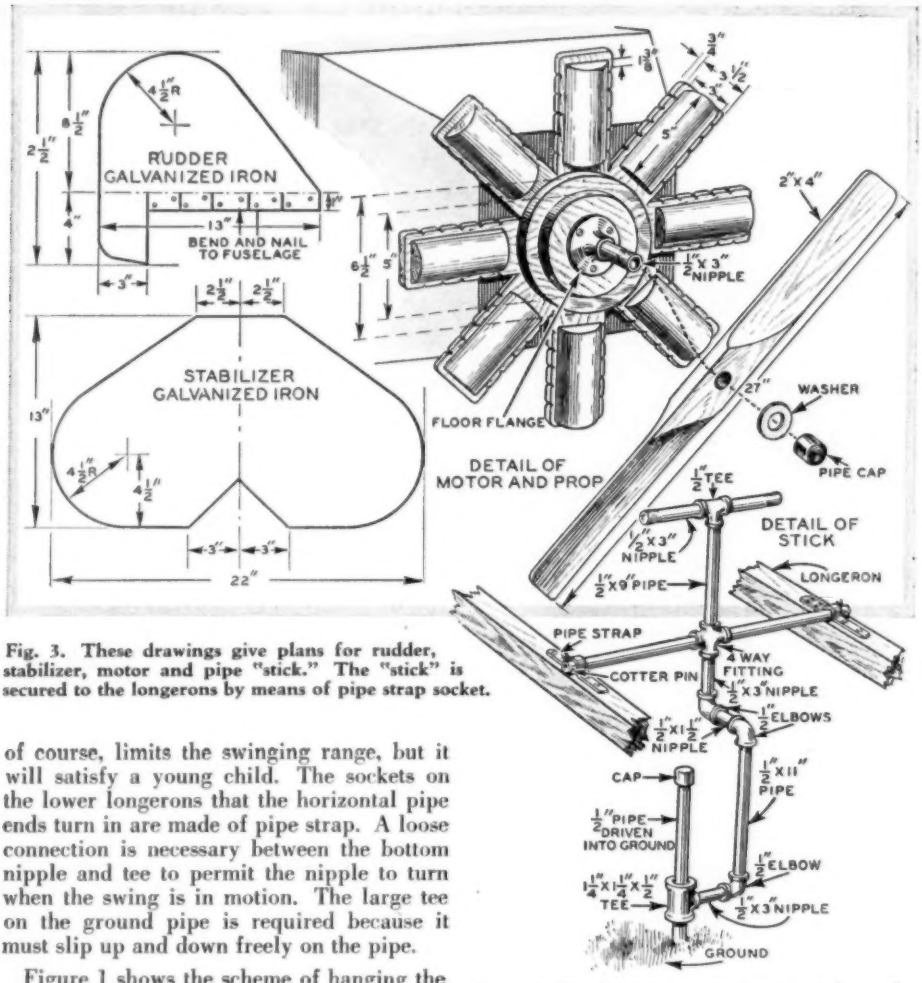


Fig. 3. These drawings give plans for rudder, stabilizer, motor and pipe "stick." The "stick" is secured to the longerons by means of pipe strap socket.

of course, limits the swinging range, but it will satisfy a young child. The sockets on the lower longerons that the horizontal pipe ends turn in are made of pipe strap. A loose connection is necessary between the bottom nipple and tee to permit the nipple to turn when the swing is in motion. The large tee on the ground pipe is required because it must slip up and down freely on the pipe.

Figure 1 shows the scheme of hanging the airplane swing from a tree branch or other support. There is no advantage in using the perforated pipe strap, except that it is easy to obtain, and the perforations save the drilling of bolt holes. Hammock chain would be better for a free swinging job.

When the swing is hung, give all metal work a coat of red lead, then finish surfaces with automobile enamel in bright colors.

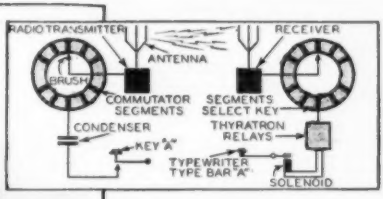
To make your swing look and operate more like a real airplane you can mount an electric motor in the nose and attach the propeller to the shaft. With the prop whirring round at a good speed, your swing will have the appearance of a large plane in actual flight. Current for the motor can be taken from the house supply by means of an extension.

This arrangement, however, might prove dangerous if small children are around, so it would be advisable to build a large shield for the prop.

If you wish to increase the range of the swing, it will be a good idea to suspend it higher in the air, and at the same time increase the length of the pipe between the cross piece and the elbow which slides on the ground pipe. This ground pipe will also have to extend up further from the ground. It will require more effort to operate the swing like this but there will be much more fun in it.

Messages Now Typewritten Over Radio

Glenn W. Watson (right) demonstrating his Watsongraph receiver. The typewriter is operated by thyratron relays through receiver at right.



Wiring diagram of the Watsongraph sender and receiver. Key "A" charges condenser wired to commutator moving in synchronism with receiver commutator, which operates key through thyratron relay.

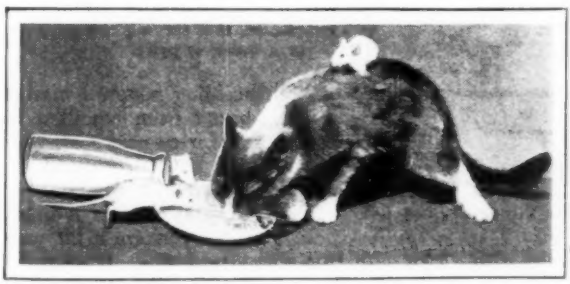
Here is the Watsongraph sender. Pressing key of keyboard operates same key on the receiver.

HOLDING possibilities of revolutionizing our present system of communication, a new type of transmitter, called a Watsongraph, from its inventor, Glenn W. Watson, has been devised for sending typewritten messages over radio.

The Watsongraph sender and receiver each have a commutator and segments which correspond to the characters of the typewriter. In the sender each segment is connected to a condenser, which is charged when the corresponding typewriter key is actuated, and discharged when it is contacted by a brush which moves synchronously with a similar brush of the receiver.

At the receiving end a system of thyratron tubes supplies the required power to operate the receiving typewriter, as shown in the accompanying diagram.

With this Watsongraph, the cost of news dissemination is reduced considerably.



"Patsy" is shown here having a meal with her foster-children.

Cat Mothers White Mice

"PATSY," pet cat of Miss Madge Mahoney, of Brooklyn, must have read all about the peace talk in Washington and decided to take it to heart, for she has put aside all her feline hatred of her age-old enemies, rats, and is mothering four white rodents as if they were her kittens. At the left we see her having a meal of milk with her foster children without any hard feelings whatever.

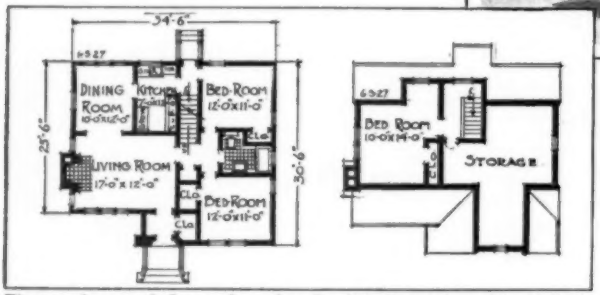
It's "Home Cheap Home"

Here is the attractive story and a half English type bungalow, No. 6-S-28, finished in stucco.

Now is the time to build, when prices of material are at a low level. Mr. Flagg tells you here what kind of a house to construct to take advantage of the unusually low prices now prevailing.

EVERYONE knows the stock market saying: "Buy when they're cheap; sell when they're high." But sound advice isn't always followed when times are booming, prices rising and people spending.

Applied to studs as sheeting, this rigid board form insulation takes plaster, thus serving two purposes at a one-cost price.



First and second floor plans for English Bungalow, No. 6-S-28.

It's just as true with home builders as with stock speculators. If you are planning to build you can take advantage of a rock bottom building material market that hasn't been equalled in years as far as prices are concerned. It's "Home Cheap Home" Time, and How — RIGHT NOW — this minute!

Perhaps you are a bit panicky with fear about the future. If so, don't plunge. Don't overbuild. If you are short on cash and paying rent, why not find out

Time—and How!

by MAURICE I. FLAGG
Director, Small Homes Bureau

HOW TO GET A BLUEPRINT AND TWO PLAN BOOKS

A one-sheet blueprint of any house appearing in Modern Mechanics magazine may be had for $1.00, postage prepaid. Two new plan books, HOMES FOR NEWLYWEDS, containing 32 of the latest ideas for low cost homes in all styles, and 16 SELECTED HOMES FOR LEAN PURSES containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanics magazine, Minneapolis, Minn., for blueprints and plan books.

This all-wood Colonial bungalow, No. 4-W-3, is most suitable house for home builders with average salary, and can be built on a small lot forty feet wide.

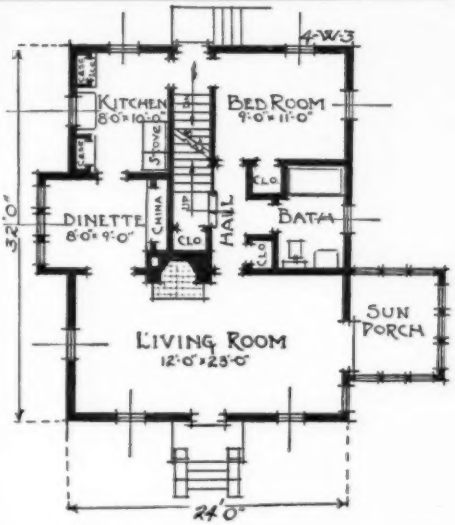
what the same amount of rent money can build in a home of your own? Now is the time.

A question most everyone wants answered is "How much am I justified in putting into a new home?" Well, let's see what the experts say.

A recent nationwide survey by the United States Building and Loan League says it is sound economics for the American workingman to spend two years' salary for a new house. If you are earning $100 per month, then $2400 is a fair amount of money to invest. Perhaps more, provided you regard the money you put into a house as a savings account. At $150 per month you can spend $3600 for a house. At $200 per month, $5000 is a fair outlay for housing the family.

I have selected two houses for this issue to illustrate what may be called average types houses within the salary ranges of $1800 to $3000. The Colonial bungalow, 4-W-3, is what Uncle Sam's Department of Labor says comes pretty close to representing Mr. "Average Man's" house in size and equipment. The job complete, including the lot, was approximately $4500.

The English type story and one-half bungalow, No. 6-S-27, is somewhat larger and therefore the cost is higher. It's a $5500 to $6500 price range, depending upon where it is built and how it is equipped. The first house could be paid for by two years' salary out of a $2000 income. The second house out of a $2500 to $3000 salary.

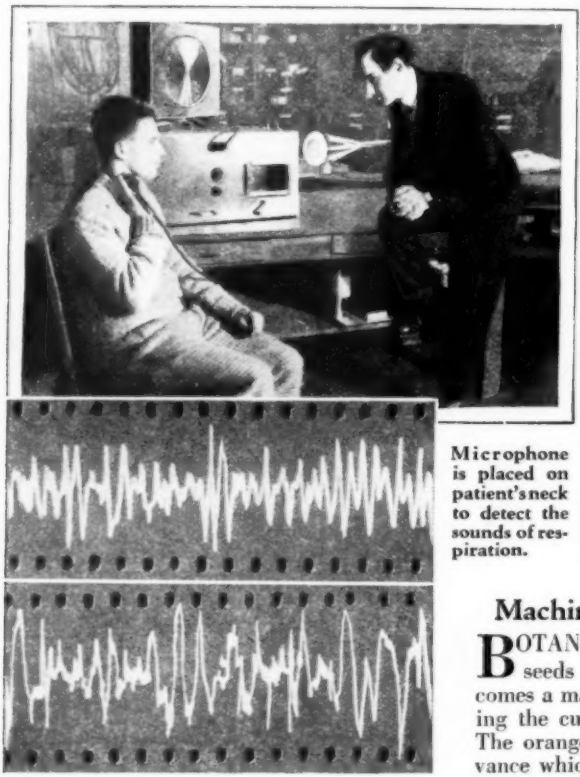


Floor plans for Colonial bungalow, No. 4-W-3, shown in photo above. Blue print of this house may be had by mailing $1.00 to Modern Mechanics and Inventions Home Building Editor, 529 So. 7th St., Minneapolis, Minn.

It is possible that due to the present market conditions with prices scraping bottom that both houses can be bettered in final costs. Also, they may be somewhat higher. There is this to be said, however, that money put into home building now will buy much more than it has the past few years. It's a buyer's market, and the wise home builder will take

(Continued on page 194)

Throat "Mike" Shows What Your Breathing Looks Like



Microphone is placed on patient's neck to detect the sounds of respiration.

Feeble sounds of human breath are recorded on film through amplifier as shown here. The upper filmband is typical sound curve of a healthy lung. The lower filmband shows curve of infected lung.

MAKING a patient's breathing visible by means of an amplifier which intensifies the most feeble sounds and a highly sensitive microphone placed on the neck of the subject, is the remarkable feat performed by a new device recently invented by Manfred Von Ardenne and Dr. M. Werner, Berlin physicists, for the purpose of studying lung diseases.

The microphone of the device detects the faint sound of the breath passing through the patient's windpipe, while the amplifier transforms the sound into lines on a film, as shown in accompanying drawings, to make a record of the respiration. Physicians are by this means enabled to study changes taking place during illness and detect symptoms.

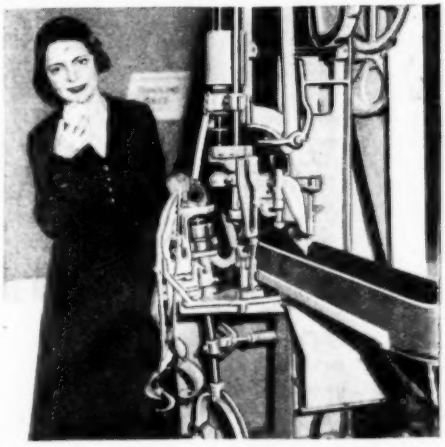
Emetic in Poison Prevents Suicide

A PLAN to stop the suicides by poison, which have increased alarmingly in Hungary, has been proposed to the police department of Budapest. The plan is to mix with every poison that is sold some other drug which will cause the poison to act instantly as an emetic in case it is swallowed, so that the intended fatal dose will be its own antidote.

Most of the persons who take poison repent promptly of their act and try to get some one to save them. Swallowing the emetic-poison mixture would give the mentally unstable victim all the thrill of committing suicide but would result only in some rather unpleasant sensations without irreparable harm, and would save his life.

Machine Peels Oranges Rapidly

BOTANISTS have succeeded in removing seeds from oranges, and now along comes a machine that removes the skin, leaving the customer nothing to do but to eat. The oranges are simply placed in a contrivance which grips the orange and then proceeds to peel it with a stationary knife as the fruit revolves.



This machine peels oranges ready for eating.

GLIDER *of the* HIGHWAY!

SOARING down the roads — effortless — silent — smooth — the Harley-Davidson is a true Glider of the Highway. It responds instantly to every whim — answers every sway of your body.

Give the throttle a twist and instantly your Twin becomes a brute of a thing — pulsing with power — eager to snort over hills, or race down a straightaway. That's motorcycling — sport of a thousand thrills!

So inexpensive, too. A Harley-Davidson costs little to buy — almost nothing to run.

Let your Dealer show you the 1931 Twins, Single, and Sidecars. Ask about his Pay-As-You-Ride Plan.

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My age is ( ) 16-19 years, ( ) 20-30 years, ( ) 31 years and up, ( ) under 16 years. Check your age group.

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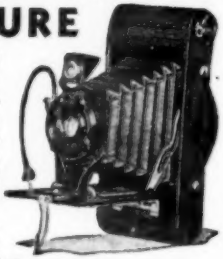

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Will the Nautilus Freeze Under Ice?

(Continued from page 50)

who spent nine years in the submarine service that the *Nautilus* commanders are over-optimistic. If they attempt to do what they promise to do, it will be nothing more than outright suicide. Their apparatus cannot cope with the natural forces which will be encountered. It is a most interesting enterprise, but we old Navy hands cannot help but regard it as purely a stunt. Nothing will save them once they get stuck underneath an iceberg. But there are some very able men on the *Nautilus* and we are sure they will hesitate before deciding to penetrate beneath icebergs and bank their hopes on ice-boring drills. In all fairness, we give Sir Hubert Wilkins and his associates credit for undertaking one of the most spectacular and dramatic adventures of modern times."

Commander G. W. Simpson, noted naval and submarine authority at the Brooklyn Navy Yard, says:

"The wise men of the United States Navy are snickering up their sleeves when they read about the expectations of the Wilkins expedition. I am making these comments in a strictly impersonal but nevertheless scientific manner. The U. S. Navy would never think of sending a crew on such a foolhardy expedition. However, if some great emergency arose, the valiant Navy men would not hesitate to embark on any expedition which demands daring and fearlessness. But this particular voyage, to my mind, is nothing more than a stunt. It is based purely on guesswork. They are hoping to find pockets of water interspersing the Arctic ice at intervals so that their submarine might rise to the surface. If they once got caught in some ice, say beneath an iceberg over 150 feet in depth, all the drills in Heaven could not get them out of their predicament. I know I wouldn't care to be going along."

Vilhjalmur Stefannson, veteran Arctic explorer who is given credit as being the first to suggest the idea of submarine polar exploration, is not as optimistic over the Wilkins expedition as he might be expected to be. He says:

"Sir Hubert Wilkins was second in command of my third expedition from 1913 to 1918. He told me that the first time that he heard me outline a plan for a submarine voyage of exploration in the Arctic was im-

(Continued on page 182)

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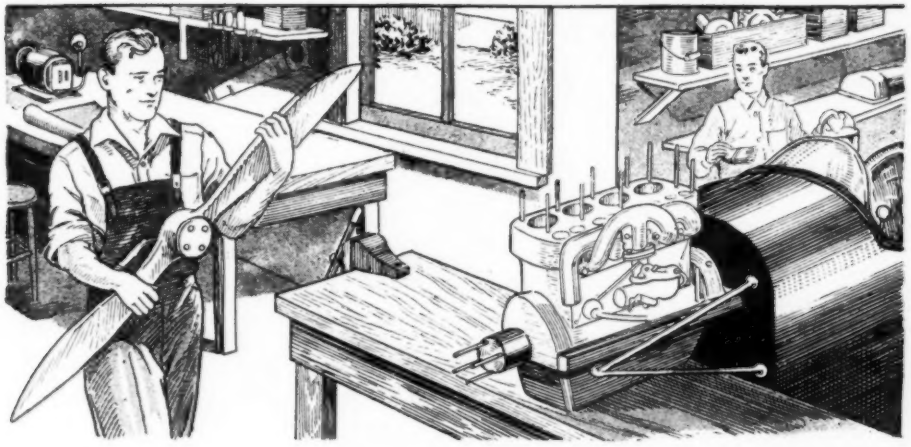

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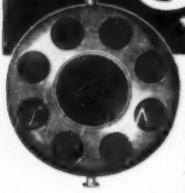

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Will the Nautilus Freeze Under Ice?

(Continued from page 180)

mediately after he joined in 1913. I never published anything about it until after I told Admiral Peary my ideas.

"Of course, it pleases me very much that Sir Hubert is adopting my plan, but I am also worried because it is a dangerous enterprise. Ten or twenty years from now a submarine voyage of this nature will be a commonplace thing and not dangerous, but at the present time it is a mighty dangerous undertaking. Wilkins is not foolhardy, but at the same time he always wants to be doing something and accomplishing things. Fear is absolutely foreign to his nature.

"It may be that Sir Hubert has hit on some new way of cutting through the ice. I think it is feasible to blast upward through the ice. A charge could be planted; then the submarine might withdraw half a mile or so and the charge could be exploded, after which the submarine could return. Of course, one could not blast the ice near the submarine because of the danger of wrecking the ship.

"The maximum thickness of the Arctic icepack is not more than 120 feet. The crushing and piling up of the ice accounts for this thickness. By actual freezing, however, the ice is never more than seventy feet thick. There are no icebergs in the Polar Sea. If a submarine navigated at a depth of 150 feet it would be quite safe and it would not strike any snags of ice.

"Sir Hubert might meet icebergs in the regions of Spitzbergen or in the region of Greenland, but in those regions he would be navigating on the surface and he would avoid icebergs in the same way as any other ship. In connection with the depths at which submarines operate, the Italians claim a record of 325 feet.

"As to the direction of the submarine voyage, it would be much safer to cross the Arctic from Alaska to Norway rather than from Norway to Alaska because the current is against you if you go from Norway to Alaska. If the machinery of the submarine broke down, the vessel would drift toward open water should the accident occur on the Norwegian side. He could send out S O S calls and be picked up. If such an accident occurred on the Alaska side, his only hope would be to leave the submarine and walk across the ice in the direction of Alaska."

Commander Donald B. MacMillan, famous for his polar explorations, has described the

Will the Nautilus Freeze Under Ice?

Wilkins expedition as the most hazardous proposition ever undertaken by an Arctic explorer.

"The submarine can reach the North Pole only by chance," he says, "because navigation is dependent on the moon and stars, and when submerged the ship's captain can not get his navigation points. If caught in an ice pack, the submarine would have no chance to escape. I have seen polar ice 40 feet thick."

Several British submarine officers have expressed the opinion that no submarine can act as an ice-breaker in the Arctic, and that even if it were able to come to the surface, it would freeze in solid while recharging its batteries. To controvert these opinions, backers of the expedition point out that Simon Lake has carried out successful experiments with an ice-breaking submarine, and that the *Nautilus* cannot get frozen into the ice on the surface of the Arctic seas because, during the months of July and August when the expedition will be under way, there are no freezing temperatures of water or air.

In addition to the safety devices already described, the interior arrangements of the *Nautilus* are interesting for the measures that have been taken to increase the comfort of the crew. Naturally, there is no room for luxuries in the way of unnecessary equipment. A laboratory compartment is provided for the scientific members of the crew. Fuel oil for the Diesel engines and distilled water for the storage battery are stored in tanks along the keel of the sub. Likewise the 60-ton storage battery, of 120 cells, is mounted underfoot. The control room is not greatly changed from its arrangement when the submarine was a member of Uncle Sam's Navy, bearing the title U. S. S. 0-12.

A galley is provided with an electric range, electric vacuum cooker, and electric icebox. The engine room houses two great Diesel engines of 500 horsepower each, and two 200 horsepower electric motors driven by the 5000-ampere battery.

The insulation method used to keep the submarine comfortably warm is illustrated in the sectional drawing on page 48. A light sheet metal inner wall is installed inside the hull of the submarine. Vents at the top permit warm air to pass upward into the space between the walls. Any moisture in the air is condensed and drips down the wall into the

(Continued on page 184)

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Will the Nautilus Freeze Under Ice?

(Continued from page 183)

bilges. This keeps the ship fairly warm and comfortably dry.

Air at a pressure of 2500 pounds per square inch is carried in flasks, for breathing and for blowing water out of the buoyancy tanks. When the vessel is on the surface, the air is renewed by running compressors which operate in much the same fashion as those used in tire stations. This air will keep the crew alive for about three days when submerged, and by the use of oxygen and chemicals to remove poisonous gases, the living time can be increased to about a week.

In case the *Nautilus* is disabled, the crew will not necessarily be left on the ice to meet a slow and painful death. The submarine carries a short-wave radio broadcasting set with which she will keep in touch with the outside world, and in case of an emergency an appeal for help can be sent over the ether and rescue crews can start out to help the stranded crew to safety. The supply of provisions carried aboard the ship is ample to take care of the crew for several months. Sleds and other equipment necessary for a journey across the ice are carried. The crew would be self-sustaining for an entire year in the matter of provisions, and in addition rifles are carried by which seals and polar bears can be shot down for fresh meat.

Despite the fact that the submarine will invade polar waters, an electric refrigerator for preserving food will be carried, since the sub's interior will be fairly warm.

Since most of the navigation must be done by instruments or dead reckoning, in case the ice proves too thick for the navigator to emerge and get his bearings from the stars, the matter of compasses is important. Two types are carried on the *Nautilus* — one is magnetic, the other the gyro-compass. The magnetic compass is likely to prove undependable near the North Pole, and in any event such compasses are badly handicapped on board a submarine, where the masses of metal such as engines, and the electric currents from the batteries, are likely to throw it off.

Gyro-compasses do not depend on magnetism, pointing to the true North Pole rather than the magnetic pole. The gyro-compass will therefore prove of little value near the Pole, since when it is sitting on top of the pole, in effect, it has nothing to point to.

Will the Nautilus Freeze Under Ice?

The special diving chambers on the *Nautilus* will permit divers to emerge under water, where they can work on damaged propeller blades or other parts of the sub which may need repair. A well-fitted machine shop is carried along so that the vitally important matter of making speedy repairs is provided for.

Naturally it will be difficult for divers to work efficiently in the cold waters of the Polar sea. But the submarine *S-4*, which sank off Provincetown, Mass., a few years ago, was salvaged in the dead of winter. Frank Crilley, who helped in the *S-4* job, is head diver aboard the *Nautilus*, so he knows exactly what difficulties he will have to overcome.

A few specifications of the *Nautilus* will prove interesting. The sub is being used by special permission of the United States government, there being no privately owned submarines. The Wilkins expedition has leased the *Nautilus* for a period of five years, at the end of which it will be returned to the government for scrapping under the terms of international disarmament treaties. The *Nautilus* is 175 feet long, with a cross-section diameter of 15 feet 9 inches. It is capable of a maximum surface speed of 14 knots, or 10½ knots submerged. Its maximum cruising radius is 7000 miles. Provisions carried will weigh over 20 tons, and scientific instruments 15 tons. The value of the submarine is estimated at $750,000. The name *Nautilus* was bestowed on the sub in honor of the famous ship of the same name piloted by Captain Nemo in Jules Verne's "20,000 Leagues Under the Sea."

The periscope carried differs from those conventionally used in that it folds together like a jackknife. This is to protect it from damage by bumping against ice crags which would tear it off within a short time. The periscope will be used only in open water. A trolley pole "feeler" on top of the sub will run along under the surface of the ice as a sort of guide wheel, the submarine being so adjusted as to buoyancy that the slight contact of the wheel against the ice will be sufficient to keep the ship's hull from colliding with projections. The guide arm will also serve to give information on the degree of the ship's buoyancy through the reading of pressure indicators on the pneumatic piston

(Continued on page 186)

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Will the Nautilus Freeze Under Ice?

(Continued from page 185)

which keeps the arm in contact with the ice.

Momsen "lungs", which in appearance resemble gas masks, will be carried for each member of the crew. In case it is necessary to escape from the sub under water, these lungs can be donned by the men and the necessary oxygen will be supplied to them mechanically as they swim upward to the surface, eliminating the possibility of drowning. Of course it is hoped that it will not become necessary to resort to these lungs, but no precaution has been overlooked which might conceivably save human lives.

It becomes evident, on studying the preparations made by Sir Hubert Wilkins and his men, that if it is humanly possible to succeed in their daring journey, they will come through gloriously.

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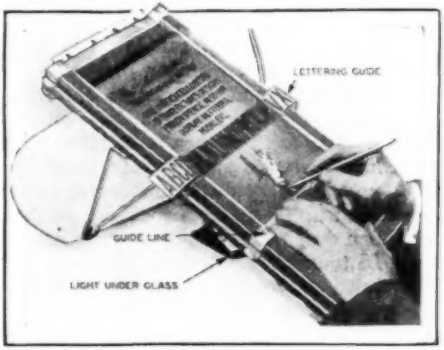

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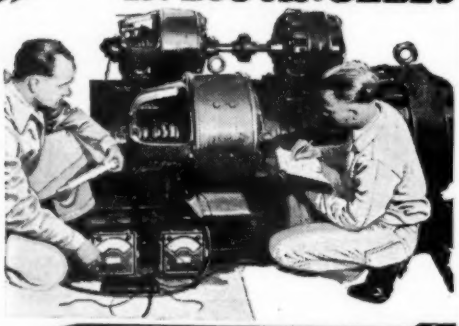

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Artificial Life From Chemicals

(Continued from page 169)

so absorbing that one can spend hours watching them. They are the most astounding artificial creations imaginable.

Several different combinations are possible, the alkaline solution being modifiable in many ways. However, the phenomenon depends upon osmotic pressure at all times. The oil and gasoline penetrate the soapy drops and cause changes in the superficial tension. Consequently, the ruptures of equilibrium, due to the successive deformations, cause the colpoides to move about. The vacuoles are formed by excess of liquid.

There is another experiment which produces a radically different type of chemical life. These beautiful and varied creations are called plants. Although actually lifeless like the colpoides, they prove to be so fascinating that it is very difficult to decide when to quit working with them. The procedure for this experiment is even simpler than the other.

Make a solution of about three parts of water to one part of commercial waterglass. Put this mixture in a clear, wide-mouthed, glass bottle, then drop in a crystal or two of cobalt chloride or cupric sulphate, and watch what transpires! The cobalt salt will produce a beautiful blue plant, while cupric sulphate gives a bluish-green growth. Nickel nitrate plants are light green, and manganese sulphate produces a pure white vegetation. Iron chloride gives a red plant. Only crystals of these salts should be used. They can be procured either at a full-fledged drug store or a chemical supply house at a reasonable price. A few ounces of each will be sufficient.

There are a few other combinations that can be effected to a good advantage, but, as a rule, all of the plants will be long and straight. The use of other salts will bring some success, and interesting growths can be produced from a potassium or sodium ferrocyanide solution.

Make a 10% solution of potassium ferrocyanide and add crystals of cupric chloride. A flat red stalk will thus be produced. For branching growth use cobalt nitrate or ferrous sulphate.

An excellent container for these chemical plants is a gold fish bowl. The object of the globe shaped container being to magnify the attractive, fantastic plants within.

Radiophone Aids Flying

(Continued from page 168)

he is advised in his actions and duties by a qualified transport pilot always on duty in the traffic tower. The pilot is there because of his expert knowledge of aerial conditions, and to advise the dispatcher concerning conditions upon which only a pilot would be qualified to advise other pilots in the air.

Another highly important function of the radio telephone is to relieve aviation of the danger of collisions in the vicinity of airports, particularly during the hours of traffic peaks. At the Alhambra airport, for example, aerial traffic is at its peak load between 7 and 8 o'clock in the evening. During that hour planes are arriving and departing from all parts of the United States and Mexico, and it is nothing unusual for two or three incoming planes to arrive over the field when one plane is about to take off.

Collision Danger Averted

The danger of collisions would be very great but for the fact that the radio telephone now gives the dispatcher complete command of the situation. Under such circumstances two or more planes may be ordered to remain in the air while another lands or takes off. The dispatcher handles such situations according to the circumstances, and in an orderly fashion. Left to the various pilots, confusion and danger might very easily result in the vicinity of busy airports.

Radio compass and radio beacon experiments are now also going forward at the Alhambra airport. A radio beacon is already in operation to inform pilots when they're over the field, even during conditions of obscured visibility. Aviators approaching the field come within its sphere of influence twenty miles away. The beacon impulses are recorded by an instrument with an oscillating pendulum. These impulses become stronger as the field is approached, and turn on a colored light on the pilot's instrument board when the plane gets over the field.

A radio compass has now been developed with which the pilot can take bearings on any station transmitting any kind of signals, either broadcast or code. By determining the directions of two or more broadcast stations, the pilot can chart out his own position, which will be at the point of intersection of the directions from which the signals come.

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Dorothy Lee

The beautiful film star whose portrait appears in natural, life-like colors on the cover of the June issue, personifies the sparkling character of this intriguing magazine which each month offers many vivid stories about your favorite stars. Read *Should Sex Be Glorified, The Lost Loves of Charlie Chaplin, The Strange Case of Marian Marsh* and a host of other outstanding, brilliant features in

JUNE

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Uncle Sam's Poison Squad

(Continued from page 149)

ill were sent for inspection to the laboratories of the Food, Drug, and Insecticide Administration. Samples of the cake were fed to animals in the laboratory and these animals promptly showed symptoms of poisoning. Chemical analysis showed the cake to be heavily loaded with arsenic; nearly 2,000 times the amount which is regarded as being within the limit of safety. The cake had been purchased from a housekeeper who conducts a small retail business in home-baked fruit cakes for the holiday season.

Inspector Larrick, assigned to the investigation, discovered that the arsenic contaminated cake was one of nine baked for the Christmas trade, three of which had been sold. One cake had made six people ill; another had poisoned four people. The third cake had been bought by a house-to-house agent whose identity and whereabouts were unknown, but who had stated that the cake was to be sent to relatives in Canada.

Larrick tried to locate this agent in Washington and New York through the manufacturers and distributors of the commodity sold by the agent, without success. Then he canvassed each house in the neighborhood where the cake had been sold, and two days before Christmas he found a colored woman who told Larrick of another colored woman in a nearby town, who "might know the agent". The inspector was informed by this second person that the agent had lived in that neighborhood but had moved some time previously without leaving a new address; however, that the agent had a relative, back country.

Larrick located this relative, and told him that at the time the cake was bought, the agent had said something about sending the cake to relatives in Canada. The Canadian relatives were called by long distance telephone, and the cake was found,—the night before Christmas. Larrick's job was not finished, however, until he should run down the source of the poison.

Inquiry in the home where the cake was made showed that whenever the flour from a certain sack was used, the symptoms of poisoning recurred. Chemical analysis showed the flour to be heavily contaminated with arsenic, and the significance of this discovery, if the flour was representative of other flour of the same brand which had been commercially distributed, was appal-

Uncle Sam's Poison Squad

ling. The prospect of wholesale poisoning of flour users was visualized by the inspector, who took immediate steps to investigate the mill, the warehouse, and the stores from which the flour had probably been obtained. No contamination with arsenic was uncovered at any of these points.

A second search of the premises disclosed an empty sack containing minute quantities of a white powder which proved to be calcium arsenate, the same substance found in the flour and fruit cakes. It was later established that the calcium arsenate, bought for garden use, had become mixed accidentally with the flour.

"Poison Squad" officials lay down a few simple rules for safeguarding against food poisoning. All poisons should be plainly labeled and stored in a safe place away from food products. Arsenical insecticides may easily be mistaken for flour. Food to be eaten raw should be fresh, clean, free from abnormal odors, rotting areas and from mold, and should be washed in clean water fit for drinking purposes. Cooked foods should be heated to the boiling point.

Foods such as meat pies, scalloped fish or oysters, hash, some salads, puddings, custards and cream pie fillings may cause illness because in the process of preparation insufficient heating is used to destroy the bacteria or their toxins. Never use food from cans showing springing, flipping or swelled lids. Throw away, without tasting, any food from glass jars showing leaks around the rubber rings, cloudiness of the liquid, or spurting of the contents when the bottle is opened. Sound food freshly and thoroughly cooked does not cause food poisoning.

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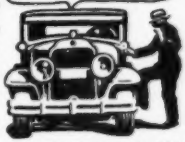

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Thrill Makers of Coney Island

(Continued from page 82)

teeth of steel which sink into the links of a chain which rotates about two small wheels at the base. The chain turns with these wheels and drives the Ferris wheel around as it carries its teeth along its five-foot course and releases them. Then at the other end new teeth are picked up and carried on. A small motor supplies the power to the two small wheels.

One of the favorite rides is the Scooter, which consists of miniature automobiles. They are operated on an enclosure with a floor of steel plates and a ceiling of screen-wire which supplies electricity to the small auto by means of a rod which extends up from the rear of the car and moves along the screening on a small wheel. These cars are for the most part uncontrollable, despite the existence of the steering gears, and the chief joy is derived from crashing into other cars. There are no casualties because of the thick rubber fenders which protect each car.

The Heyday is a variation of this. The cars revolve about a track and follow a given line of motion, although the optical illusion makes it appear that one car will crash into another any moment. In this case the forward wheels of the car stick to the straight line, while the rear careens madly about on unregulated wheels.

In the Frolic, which is a modification of the merry-go-round, the carriages swing around in a circular course on a pivot. There are springs and depressions in the track which control the rise and fall of the carriage and its swaying. The airplanes which whirl around on rods which are suspended from motor-driven bars follow the same principles. In all these devices, which are the most popular attractions at Coney, one perceives that thrill is supplied with absolute safety.

The element of surprise, mingled with mechanical co-operation, proves a good drawing-card. The crazy-house fits into this class. There are several of them, but the most conspicuous one is Noah's Ark on the boardwalk. Here one finds sliding stairs which slip from under you if you don't watch out. You grab a rail to keep from falling and you get a shock. Some one has sent a few volts through the rail.

There are dark corners out of which a

sheet will sweep. Some one screams that there are spooks. You try to run back and find that you have just traversed a turnstile which works only one way. Mirrors distort your face and body into monstrous shapes. Then there is a high, smooth slide which winds you up in a pit.

All along the route in the crazy house there are little holes in the floor through which air is suddenly gushed, raising havoc with your skirt if you are a woman. A man concealed in a lofty perch controls these air-holes just as he does the electricity which shoots through the rails.

A psychological commentary may be gleaned from the observations of the owner of the Noah's Ark crazy-house. "Although many young people and women are filled with horror and scream with fright on their first visit through the place, they are always anxious to repeat the journey once they are safe in the open again. Two old-maidish dames once went through the place 48 times, actually. They must have liked that slide, I guess."

Everything conceivable in the amusement world may be found at Coney. Its governors have overlooked nothing with appeal in this prodigious enterprise which depends for profit on the public's palate for pleasure. They make it plain that there is room for many more mechanical devices. The multitudes are always seeking new thrills, in keeping with the laws of human nature. What they want and are always seeking is something which is a product of this fertile machine age, something gorgeous and thrilling.

The Coney Island Chamber of Commerce, an association which cautiously guards the destinies of the business men along the $1,000,000 boardwalk, estimates that the total earnings of its members during the five-month season amount to nearly $60,000,000, striking up an average of $1.00 for each individual which crosses its circumference during the summer.

As a vast business enterprise founded on fun, Coney Island should not make a bad showing in Bradstreets. Its pleasures afford fat dividends. One might be amazed to learn that its earnings compare favorably with those of the United States Steel Corporation, one of the foremost industries in America. For the first five months of 1930, United States Steel grossed a little over $60,000,000.

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The World's Best Western Stories for JUNE

South of the Rio Grande

Western cavaliers of danger, the professional trouble shooters were lured below the border to right two wrongs, and lead Murdock, the killer, to a noose.

***by* ARTHUR GUY EMPEY**

A choice selection of westerns for the month includes stories by such well known writers as Herbert L. McNary, Hapsburg Liebe, Robert Ames Bennet, Homer King Gordon, Stephen Payne, Lew Holt, John Winburn and Allan Krech Echols.

JUNE Issue NOW ON SALE

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If your newsdealer is sold out, send twenty-five cents in stamps to Fawcett Publications, Inc., 529 South Seventh Street, Minneapolis, Minn., and a copy of the June issue will be mailed to you.

Prizes For Baby Autos

(Continued from page 106)

of an old style motorcycle engine in which the belt drive was popular. The wheels are motorcycle type, the front ones with brakes in hub. The left rear wheel requires the addition of a flanged pulley to accommodate the drive belt.

Steering gear consists of a wheel, a drum or bobbin, and a few feet of stranded steel cable. Four pulleys guide the cable from the drum to the front axle, as shown, so that the wheel winds and unwinds the cable around the drum and thus rotates the front axle on its central pivot.

Springing of the car is simple, an ordinary motorcycle spring being used for the front axle, and the rear one making use of airplane shock cord. The body frame follows airplane practice; it is really a fuselage. It can be covered with fabric, doped, or a plywood finish can be used.

Most motorcycle motors are equipped with kick starters, and with a little ingenuity you can arrange the starter so that it operates from a pedal in the cockpit.

These suggestions will no doubt bring a score of others to your mind—so get busy and send in your entry! Remember, it has until August first to reach us. There's no reason why that $100 prize, or one of the smaller ones, shouldn't go to you. In judging the winners, the car which shows the best results from the minimum of expense will rake in the prize money. Get going!

It's "Home Cheap Home" Time

(Continued from page 177)

advantage of the price situation.

Step into the houses with me for a minute and see what they offer for the money. The Colonial bungalow 4-W-3 is an all wood affair, which means the least initial outlay of cash. It can be built on a 40-foot lot. And there's a full basement, including laundry, heater, fuel and vegetable rooms.

Notice the living room stretching across the entire front of the house and opening from one end onto a sun porch, while the other end opens onto a dinette. The dinette is equipped with cupboard space for china storage. A triple window admits light and sunshine into this room. The sun porch is enclosed and may be used for emergency sleeping purposes. The kitchen is compact

It's "Home Cheap Home" Time

and has all the equipment that housewives demand—ice box, stove, cupboard space and cross ventilation. One bedroom and bathroom complete the first floor equipment.

A fireplace is a feature of the living room. This may be omitted to save $200 to $300. There are three closets on the first floor. Space on the second floor offers additional sleeping area and also storage. A dormer window added to the rear would make the second floor area still more useful.

The English type story and one-half bungalow, No. 6-S-28, is a somewhat larger house. For that reason it costs more to build. You have complete bungalow equipment on the first floor including two bedrooms. Space above for storage and a third bedroom makes this house ideal equipment for the average family.

Study the plan carefully. Note how the enclosed front entrance porch opens onto the living room and how the living room appears larger due to the adjoining dining room. It would be easy to add a sun porch to the rear of the dining room. The kitchen is hardly larger than a kitchenette but it was planned that way as a "wife saver." A fireplace is a living room feature. If you find it necessary to skimp in order to spread your dollars as far as possible you can omit the fireplace, but it would detract from the fine appearance of the house. It might also lessen the resale value.

The house is frame construction, stucco exterior on metal lath and wood shingle roof. It can be built of brick and whitewashed if preferred. There's a full basement, laundry, heater and fuel rooms. What's more you have a house with a large degree of style.

According to the estimate of the designer this house is in the $6000 price range, both ways—up and down. As I have said before, now is the time to build. You may be able to cut down costs considerably if you shop around with as much earnestness as you do when investigating cars and radios. Building a house is one of the biggest jobs you're ever likely to undertake, and you will be repaid many times for the hours you put in consulting with contractors, architects, masons, and others who can give you handy pointers.

Finally, build when prices are low, sell when prices are high. Two years' salary is a fair amount to spend and maybe more, but don't overreach your ability to pay for what you order.

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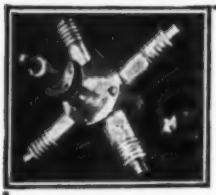

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MINIATURE AIRCRAFT CORP., 83 Lee Terrace, New Brighton, N. Y.

More Leisure in Automatic Age

(Continued from page 118)

in some remote watch station how things are running.

It is our job in the research laboratory to anticipate those needs and provide means even before industry has called for them. The old fashioned engineer and factory man who thought no one could teach him anything new because only a "practical" man could solve his problems, has disappeared. In fact one of our troubles is finding time to answer the problems that production men bring to us.

We have developed a large cathode ray tube in which the bombardment of electrons on a flourescent screen gives us a visual picture of sound and electrical waves. The same tube may be used in a television receiver which will have no mechanical moving parts. Instead of a scanning disc to create the moving lines of the picture, a varying magnetic field will divert the electronic bombardment into a series of parallel paths. Instead of the twenty-four, thirty-six or forty-eight lines which most television apparatus has used to date, the cathode tube easily handles from 80 to 120 lines per picture and gives a clear image as much as nine inches across.

Another application of grid glow tubes to the problems of industry is the stroboglow, which is used to make moving objects such as motor armatures and plane propellers appear to stand still. A pair of small bulbs, not greatly different from the neon lamps used in television, are fitted in simple reflectors, and, with the necessary electrical apparatus, provide neon flashes lasting only one three-millionth of a second, and occuring at varying rates, as the operator may desire. When the number of flashes per minute coincides exactly with the speed of revolution of a moving object, the eye, seeing it only during the flashes, apparently sees it standing still. With 1,800 flashes per minute focused on the armature of a motor turning at that speed, the poles apparently stop and letters written on them are easily read, giving the engineer an opportunity to study its vibration and other faults.

Our electric organ is an interesting example of another electronic device developed in the laboratory which may eventually find a wide market. The ordinary wind organ is limited both in its upper and lower range by various mechanical and structural diffi-

culties. With the electrical organ, which plays through loud speakers, the entire apparatus is quite compact, so there is no problem of finding space for a pipe thirty feet or more high, and the upper notes can be given exactly the same volume as the lower ones.

Essentially it is just a large radio device, to which has been added a tremolo effect obtained by using an electric motor and an eccentric to vary the distance between a pair of coils, thereby changing the inductance. The electric organ is not only more compact, and also cheaper to build, but if you want an echo organ, or a lot of echo organs, all you need is some more loud speakers placed wherever you want to echo yourself from.

One of the most interesting things being done in the laboratory is the study of the strains and stresses of metal parts of machinery by a process known as the photo-elasticity method. No one can see what strains are taking place in a piece of metal, and so the rules for design set up arbitrary factors, and then allowed a generous margin for excess—a system that was wasteful of metal and inadequate to provide proper strength.

The photo-elasticity method is based on a peculiar property of polarized light when passed through any transparent material. If the material is placed under the slightest strain the light will change through the entire spectrum, as the strain is increased, and keep on repeating as long as more stress is applied. And if the transparent material is a piece of celluloid, or similar stuff, cut to the exact size and shape of a metal machine part, the strain lines will be in the same position as the strains in the metal when submitted to a corresponding load.

Polarized light, I might explain, differs from ordinary light in that it vibrates only on one plane, and travels only in one direction. This polarized light is produced by passing it through two crystals, set at right angles to each other, so that light polarized on a vertical plane by the first cannot pass through the second, which admits only light on a horizontal plane. When the transparent celluloid model of the rail is placed between these crystals and subjected to stress, the light waves are double refracted, and two separate light beams is the result. These beams pass through the second crystal and appear on a screen as one of the colors of

(Continued on page 198)

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More Leisure in Automatic Age

(Continued from page 197)

spectrum. As the stress on the material increases the color changes, so that engineers are enabled to determine the precise strain exerted on various parts of the material being studied by watching the colors.

With this device we have found, for example, that common involute gear teeth are so designed that at one point only a single tooth in each wheel is engaged, and therefore bears all the load. By redesigning teeth so that at least two are in contact at all times, the strain is being divided between them.

A test with a piece of celluloid cut to the cross-section of a railroad rail disclosed that the fillet under the upper part, on which the car wheel rests, is a bit weak, and that there was more steel than was needed in the lower part, just above the horizontal base. By taking some material away from the latter place and adding a portion of it at the top, the steel mills will be able to roll railroad rails with less material, and yet make them actually stronger.

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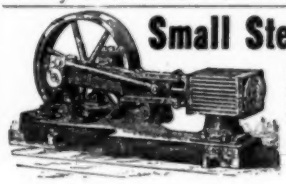

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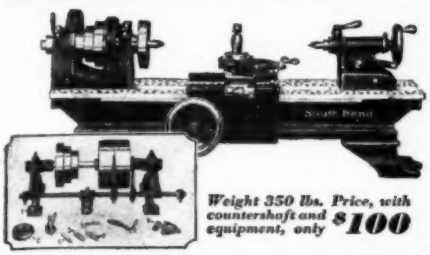

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(Continued from page 138)

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"In mounting butterflies we use what is known as a setting-board or setting block. This is a piece of wood with a groove down the center of its upper-side to permit room for the body of the butterfly. A pin is thrust through the thorax of the butterfly, which is midway between the wings, and the insect is placed on the setting-board.

"Then the wings are brought to the level of the upper-surface of the board, after the body of the butterfly has been inserted in the groove. The wings are further placed in position with setting-needles, which consist of match-sticks with ordinary needles inserted at one end.

"Next slips of tracing muslin or paper are placed over the wings and fastened down by pins. The setting-needles which were used to keep the wings in place temporarily are removed and then the setting-board is placed in a box with others to dry.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912,

Of MODERN MECHANICS AND INVENTIONS, published monthly at Minneapolis, Minnesota, for April 1, 1931.

State of Minnesota } ss.
County of Hennepin }

Before me, a Notary Public, in and for the State and county aforesaid, personally appeared W. M. Messenger, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the MODERN MECHANICS AND INVENTIONS and that the following is, to the best of his knowledge and belief a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are:

Publisher, W. H. Fawcett, Minneapolis, Minn.
Editor, Roscoe Fawcett, Minneapolis, Minn.
Managing Editor, J. G. Smalley, Minneapolis, Minn.
Business Manager W. M. Messenger, Minneapolis, Minn.

(Continued on page 201)

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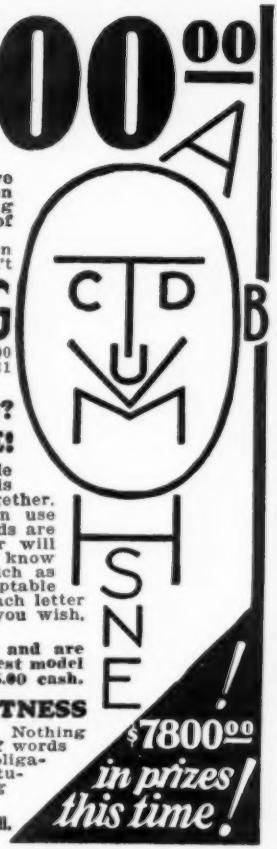

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(Continued from page 200)

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

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3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)

None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

W. M. MESSENGER,
Business Manager.

Sworn to and subscribed before me this 25th day of March, 1931.
[SEAL]
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Notary Public, Hennepin County, Minnesota.
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Jungle to Zoo With Wild Animals

(Continued from page 90)

to making an end of me, began with this simple sentence:

"We want a king cobra—a big one."

Several times I had heard those words from Dr. Raymond Ditmars of the New York Zoological Park. For a long time I had been on the lookout for a specimen that would fill the bill, but without success.

The difficulties involved in landing a big king cobra are many. Most of the Asiatic traders and trappers that supply me with specimens of other kinds, including dangerous animals and reptiles, have a fear of cobras that makes the disquiet that all other jungle terrors arouse in them seem mild in comparison.

The reason for this is that of all the creatures that dwell in the jungle of Asia it is the most vicious, being the only one that will attack without provocation. Nowhere in the world is there an animal or reptile that can quite match its unfailing determination to wipe out anything that crosses its path.

This lust to kill invests the king cobra with a quality of fiendishness that puts it in a class by itself, almost making of it a jungle synonym for death. I think of the many natives, within my own experience, that have succumbed to it, of animals that suffered the same fate.

I can't get out of my mind, for instance, the picture of a big water buffalo, a fine specimen weighing about 1,500 pounds, that, walking through a rice padi, had the misfortune to step too close to a ridge where a six-foot king cobra lay coiled up.

The uncompromising reptile struck and the buffalo was dead in less than an hour.

The ordinary poisonous reptile makes a quick strike and injects what venom it can in a fraction of a second. When the king cobra strikes it holds its victim fast in its jaw until it has completely emptied its poisonous sacs. The result is an infection from which recovery is impossible, the system being too saturated with the killing fluid.

Nine times out of ten the mere smell of a human being will send a tiger scurrying off into the jungle. The same is true of the leopard. The sudden appearance of a native child has been known to stampede a whole herd of elephants. The cobra alone refuses to admit that man is anything to worry about. Cross its path anywhere at any time and he'll raise two or three feet of his body off the

ground, stretch out his great hood and go for you.

Wherever I went all over the map of Asia I looked around to see if there wasn't a chance of picking up the king cobra that was wanted in New York. Then one day I had a stroke of luck. I was up on the northeastern border of Johore looking over some tigers. An old Malay Sakai came by with a box on his head.

It didn't take me long to see that the old baboon had something remarkable to offer—the largest king cobra I had ever seen.

In fact, it later proved to be the biggest in the world. I gave him ten dollars and the giant king cobra was mine.

I was curious to hear from the old Sakai how he had come by the tremendous cobra he had sold me. One of the Asiatic jungle's strangest products, he stood before me hugging his ten dollars to his chest, greatly pleased with his bargain and smiling that I might get a good look at the hideous black stumps that once were teeth.

One night when the jungle was a bit chill and damp, he and his comrades started a fire. Sakais have a habit of rolling in the warm ashes on such occasions. One of the men was going through these strange gymnastics when he felt something strike him in the chest.

Instinctively he reached out and grabbed it, yelling for all he was worth as he did. Curled up in the ashes, some of them half asleep, were other Sakais. When they heard their fellow tribesmen cry out they jumped up to see what was wrong. They found him holding an enormous king cobra. Seeking a warm place the cobra had come into the Sakai camp.

As the victim kept shrieking away that he had been bitten by a king cobra, one of the Sakais who had scrambled up out of the ashes got a firm hold on the snake behind the head and took it away from his doomed comrade. Only a Sakai would have had the nerve to do that.

With the old man directing the operations, a long pole and strips of rattan were quickly produced and the cobra was stretched out and lashed to the pole. Later it was transferred to an old wooden box.

The first thing I did when I got back to Singapore with my record-breaking king

(Continued on page 204)

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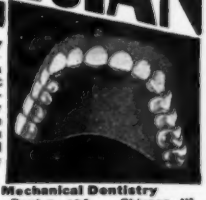

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Jungle to Zoo With Wild Animals

(Continued from page 203)

cobra was to order a fine teakwood box with a heavy plateglass top sliding in a groove. We prepared to transfer the snake by placing the old box over the new and knocking the decaying bottom out of the old

The snake would drop through and with one quick slide of the plateglass top I would finish the job of installing him in his new and more comfortable home.

I had two Chinese boys and two Malay boys working with me in the compound, which gave me more help than I needed for the simple task to be done. The scene of our operations was a nipa-thatched shed in my compound, inclosed on three sides, open in front and partly filled with empty tiger cages and other boxes stacked to the roof.

I sent one of the Chinese boys for the old box. With the rear wall of the shed at my back, I was standing beside the new box which was in readiness for its tenant. As the boy approached he stumbled over some object on the ground, jarring the box sufficiently to cause the rotten bottom to fall out. The snake fell with it, landing on the cement in front of me, belly up.

In a fraction of a second my four boys were frantically scrambling to places of safety. I was debating whether to do the same thing myself. It was really the sensible thing to do. After all, who wants to fight a cobra?

The piled-up tiger boxes formed a wall on my left, the stolid sidewall of the shed was at my right and behind me was the back of the shed.

I hesitated long enough to give the snake a chance to right itself. It reared its head three feet and spread its greenish brown hood. Then it saw me.

Instinctively I jumped backward. There wasn't far to go. Another four or five feet and I'd hit the back of the shed. As I made my brief retreat the snake struck, missing my leg by only an inch or two.

I was trapped. I suffered more from plain ordinary fright at that moment than at any time in all my long career of adventure. Through my mind flashed a quick picture of what had happened to the Sakai that this terrible reptile had bitten.

I flattened myself against the back of the shed, grimly eyeing the killer that lay almost at my feet. The expressionless eyes calmly

looking back at me gave me a cold and clammy feeling. I didn't want to die this way. Desperately I ran my eyes around for something to bring down over the enemy's head.

Anything would do, anything that could be converted into a club—a stick of wood, a . .

The cobra was poising itself for another strike. The hideous head rose slightly and stretched forward a bit.

Staring hard ahead I poised myself too . . for a fight to a finish, though just how I was going to fight I didn't know. I had nothing to fight with, nothing with which to fend off the attack.

Frantically slipping over my head the white duck coat which I was wearing over a bare skin—quaint custom of the tropics—I held it in front of me, and as the snake came on I lunged forward and threw myself upon it.

I hit the ground with a bang, the cobra under me. I could feel the wriggling body under mine, and with each wriggle I pressed down harder.

I was hopeful of keeping the reptile so weighted down that it would not be able to do anything with those murderous fangs. I screamed like a lunatic for those boys of mine. The cobra continued to squirm and wriggle.

With a crazy kind of desperation I kept pressing down with my body. Part of the snake got loose and kept hitting against my hip. In my unhinged condition I decided that the part that was free was the head and every time it struck I imagined myself being bitten.

I started yelling like mad for one of the other boys. One of the Chinese lads appeared. He was game. As I cautiously raised up a bit, not sufficient to allow the reptile to lift its head enough for a striking position, he slid his hand underneath me and made a quick grab for the snake behind the head; and as I slowly raised up higher and higher he began the process of tightly twisting the white duck coat over the cobra's mouth, head and neck until it was helpless.

Less than ten minutes later the king cobra that had almost succeeded in killing me was dropped into his new box. Dr. Ditmars was delighted with his giant cobra when it was delivered to the Bronx Zoo four weeks later.

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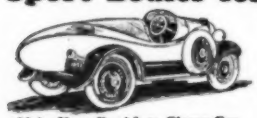

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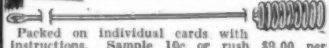

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Fiction That Can't Come True

(Continued from page 97)

have to be strong enough to withstand an outside air pressure, at sea level, of something in the neighborhood of 80,000 tons.

The exact air pressure load, of course, would depend on its shape. The longer and slimmer the cigar shaped body was, the more surface would be exposed to air pressure. But for a simple calculation on air pressure on a vacuum container consider a spherical body, as a globe has the least possible surface area for any given cubical content.

A sphere of 150 feet diameter would have a content of 1,766,250 cubic feet, which is near enough to the 2,000,000 foot capacity of an average size zeppelin. As air weighs about 80 pounds per thousand cubic feet at sea level density, and a vacuum weighs nothing, 1,766,250 cubic feet would have a lifting force of 70.65 tons. Therefore the metal sphere, the cabins, food, fuel and pay load could not exceed that weight, if it were to get off the ground at sea level, and would have to be many tons lighter to rise to any height.

But a 150 foot sphere has a surface area of 70,650 square feet, on which there would be, at sea level, an air pressure of around 15 pounds to the square inch, or a total pressure, which the extremely thin metal wall would have to withstand, of 152,613,000 pounds, in other words 76,306.5 tons.

And after inventing a metal light enough to fly but strong enough to withstand such a pressure, the airship would have a lifting force only 17,660 pounds, or less than nine tons, better than a hydrogen filled balloon of the same size!

That enormous air pressure which rests on every square inch of everything on earth, and which we so easily forget because it is equalized inside our bodies, and therefore we do not feel it, is one of the scientific facts which pseudo-scientific writers so conveniently forget or ignore.

Inter-planetary vehicles dart back and forth between the earth and Venus, Mars and the Moon in the pages of all the magazines printing this sort of fiction. They make tremendous speed and cut voyages of millions of miles to a few hours or days because, as their writers point out, outer space is presumably a vacuum in which there is no wind resistance to their passage.

But if the outer space is a vacuum, then the air pressure within the vehicle must be

maintained at ground density to enable the occupants to live, and so the problem of the vacuum airship is simply reversed. Instead of having 15 pounds to the square inch on the outside trying to crush the hull inward, we have 15 pounds to the square inch on the inside trying to blow it outward. Of the two problems the vacuum airship really presents the lesser obstacle, for a spherical metal hull will stand more compression from external pressure than it will expansion from internal strains. That's why compression members in steel buildings and bridges present less of a problem than suspension bridge cables, which are under an expanding strain.

Of course, given sufficient power to shoot a man-carrying rocket into space, it is possible to provide sufficient power to move a vehicle with walls thick enough to withstand the strain. In all of the fiction, as well as the actual attempts to build space-traveling rockets, the presence of that power is assumed.

Another favorite field of the scientific fictioneer is inter-planetary communication by wireless with the imaginary residents of Venus, Mars, or the Moon, for even the total absence of air and water on the moon have not prevented fiction writers from peopling it with human as well as animal life.

Communication with the planets in fact has not stopped with fiction, for a man in London a year or so ago spent several weeks trying to establish contact by radio with Mars. At the same time he was breaking into the newspapers with his experiment, the British government was quietly carrying out experiments to prove that the so-called "Heaviside layer" of ionized air high over the earth—a layer named for the famous mathematician who first predicted its presence—actually deflects radio signals back to earth, and therefore explains the action of short wave signals in spanning enormous distances.

The result of that experimentation was announced just a few days ago, with conclusive proof that the ionized layer does exist at a height of about 80 kilometers, and does reflect radio signals back to earth.

While the British experiments were made solely to develop the understanding and improve the processes of world-wide communication, the result throws considerable

(Continued on page 208)

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Fiction That Can't Come True

(Continued from page 207)

doubt on the possibility of ever establishing communication if some intelligent form of life does exist on one of the other planets. With at least a large part of each radio signal being reflected back by a seemingly impassable or almost impassable layer of ionized air, the prospect of forcing a signal through into outer space seems negligible.

The time element and its effect on radio signals and their strength also is ignored by the writers who play with the idea of wireless to the planets. The longest distance a radio signal ever has traveled between transmitter and receiver was spanned in a minor fraction of a second, for the farthest such a signal can be sent and actually received would be around the earth, a distance of not more than 25,000 miles, which is a mere hop, skip and a jump for a radio wave traveling 186,000 miles a second, or at the speed of light. Compare that to the many seconds, or minutes, that even radio would require to span the enormous jump to one of the planets, and consider the energy required to make such a trip!

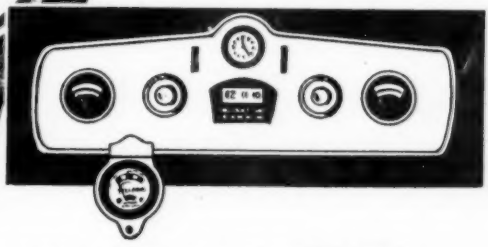
The possibility of producing sufficient power on earth to equal that given out by a star as big as the sun is so remote as to be beyond consideration, yet there is evidence that it might take power on such a scale to penetrate space with any form of signal.

Yet with all their weird and wonderful imaginings, the scientific fiction writers have left a whole field of things untouched. Astronomy offers possibilities beyond anything they have yet utilized. The mean density of the bright star Capella is about the same as pure air, so one could live at the center of it, if it wasn't for the temperature of a few million degrees and an atmosphere composed of flying electrons. Or the faint companion star of Sirius, the dog star, has a density so great that it weighs around one ton to the cubic inch, and a pebble dropped on an imaginary inhabitant would be fatal, and a grain of sand would be a lethal weapon! If that isn't enough van Maanen discovered a star whose spectrum indicates a relatively high surface temperature, a mass about one-seventh that of our sun, while the diameter is about that of our earth. That figures out to a corresponding density 400,000 times that of water, or a weight of seven tons to the cubic inch.

NEW BATTERY METER ENDS CAR TROUBLES!

AMAZING INVENTION NOW MAKES IT POSSIBLE TO HAVE A PERFECTLY CHARGED BATTERY AT ALL TIMES-NO MORE UNDER OR OVERCHARGING —NO MORE DRY BATTERIES!

Here, at last, is a simple device that takes the trouble out of batteries. It seems almost magical in its perfection. It brings your battery under finger tip control. Batteries are too hard to get at and therefore usually neglected and abused. Tel-A-Charge shows the condition of your battery right from the dash board at all times.



DOUBLES LIFE OF BATTERIES

Battery experts find overcharging is one of the greatest factors in shortening the life of batteries. With Tel-A-Charge the dangers of overcharging are past.

Is there anything more annoying than having to crank an automobile to get it started, or to be pushed or towed? On a picnic, a lonely country road, a holiday ride, in city traffic, snow drifts, blizzards, railroad crossings, anywhere at any time, your car may stall. The three things that ruin batteries and cause them to run down are mostly overcharging, undercharging and too little water. None of these things can happen with Tel-A-Charge. When your battery is in perfect condition your motor starts easier, runs smoother, has more power, gasoline is saved and expensive troubles eliminated.

YOU CAN HAVE A TEL-A-CHARGE BATTERY METER ON YOUR CAR AND IT WILL COST YOU NOTHING!

No matter what kind of a car you have, Tel-A-Charge will fit it and anyone can attach it in just a few minutes' time.

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We need men in every locality to aid us in the distribution of Tel-A-Charge and are making a proposition so unusual that workers can easily make up to $100 a week. We are furnishing those who work for us with a free sample for demonstrating purposes. Send coupon TODAY for this big opportunity and free sample offer.

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Name .....

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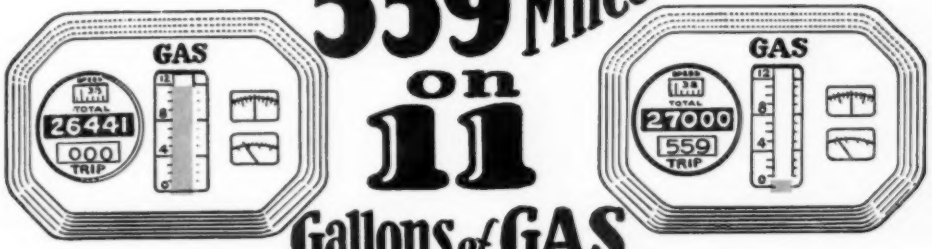
Over the Mountains from Los Angeles



Think of it! FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Imagine more than FIFTY MILES to the GALLON. That is what the WHIRLWIND CARBURETING DEVICE does for D. R. Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

THE WHIRLWIND SAVES MOTORISTS MILLIONS OF DOLLARS YEARLY

Whirlwind users, reporting the results of their tests, are amazed at the results they are getting. Letters keep streaming into the office telling of mileages all the way from 22 to 59 miles on a gallon, resulting in a saving of from 25% to 50% in gas bills alone.

Mark H. Estes writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 33 5/10 miles to the gallon. Am I glad I put it on? I'll say so!"

P. P. Goerzen writes: "I made an actual test both with and without a Whirlwind, getting 13½ miles without and 34 6/10 miles with the Whirlwind, or a gain of 21 miles to the gallon. The longer the Whirlwind is in use on the machine the better the engine runs, has more pep and quicker starting. It makes a new engine out of an old one, and starts at the touch of the starter button."

R. J. Tulp: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to the gallon and 25% in speed. We placed another on a Willys-Knight and increased from 12 to 17 miles per gallon."

Arthur Grant: "I have an Oakland touring car that has been giving me 15 miles to the gallon average, but I can see a great difference with the Whirlwind, as it climbs the big hills on high and gives me better than 23 miles to the gallon of gas, which is better than 50% saving in gas."

W. A. Scott: "I had my Whirlwind for three years. Winter and summer it gives the same perfect service, instant starting, smoother running, and what I have saved in gasoline these last few years has bought other luxuries which I could not have afforded previously."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste? Find out about this amazing little device that will pay for itself every few weeks in gas saving alone.

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

SALESMEN AND DISTRIBUTORS WANTED

To Make up to $100.00 a Week and More

Whirlwind men are making big profits supplying this fast-selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer to workers. Full particulars sent on request. Just check the coupon.

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GUARANTEE

No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.

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Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and tell me how I can get one Free. This does not obligate me in any way whatever.

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Mystery "TWIN-RAY" Light Makes Night Driving Safe

AGENTS Cleaning Huge Profits With This Instant Seller!

AGENTS and distributors all over are getting set for the biggest money of their lives with a brand-new road light that ends all the dangers of night driving. 24,000,000 motorists want this protection which guards lives against the dangers of glaring lights — yet lights up the road as clear as day. Hundreds of men have made big fortunes out of makeshift spot lights that only did half the job; hundreds more have pulled huge salaries out of lights that couldn't approach this new protection, in efficiency.

You can attach and adjust the Speedlight in fifteen minutes. Once fixed, it can't get out of alignment—it keeps a steady 1000-foot beam of glareless light between you and every danger.

67000 CANDLE POWER — NO GLARE

So judge for yourself what you can do with a light like this—a light that throws a 67,000 candlepower beam for over 1,000 feet—yet which absolutely CAN'T glare in the eyes of approaching drivers! A light which costs 30 per cent less than the prices charged for some of the best sellers in the market! A light that not only can't glare itself, but which kills the glare of the other fellow's oncoming "brights!" No wonder this light was awarded the Grand Prize and two gold medals at the Paris International Exposition—and no wonder that the very earliest agents are already cleaning up big—cleaning up like Kinney, who sold 12 lights in a day—and made $96 for just a few hours' work. No wonder new car distributors are equipping cars like Packard, Nash, Cadillac and Chevrolet with it.

There's no light like it in the world. It's not a spot. It embodies an absolutely new principle in headlighting, discovered by a famous lighting engineer.

70 MILES
Per Hour--Safely at Night

With this amazing Speedlight you can drive at 50—60—even 70 miles an hour, with perfect safety, on a road as brilliantly lighted at midnight as at mid-day. Lights up the road in spite of driving rain and snow—defies even thick fog.

MAIL THE COUPON NOW

and find out how we're putting the chance of a lifetime into your hands, with an amazing introductory offer. Find out how you can use this great device to build up a crew of your own—and double your earnings—earnings which by themselves will be bigger than you ever saw before. Do it now, before you turn this page!

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